HOME AND COMMUNITY-BASED LONG-TERM CARE SERVICES IN TAIWAN: FACTORS AND EFFECTS ASSOCIATED WITH THE UTILIZATION BY COMMUNITY DWELLING DEPENDENT ELDERLY

By

Mei-Ju Chuang

A dissertation submitted to Johns Hopkins University in conformity with the requirements for the degree of Doctor of Public Health

Baltimore, Maryland
September, 2017

Abstract

Background: The growth of population aging in Taiwan is projected to be one of the fastest aging countries in the world. In response to the increased demands of this aging society, the Taiwan government launched the 10-year Long-term Care Program (LTCP) in 2008. A variety of home- and community-based long term care services were provided to the community-dwelling dependent elderly. However, little is known about the factors related to the utilization of the long-term care program.

Purpose: To understand the factors and effects of the home- and community-based long term care services utilization among community dwelling dependent elderly in Taiwan.

Methodology: The study data were extracted from the database of "Long Term Care Plan- Chiayi City". In total, 1,294 older adults who were newly eligible and applied for the 10-year Long Term Care Plan in 2013-2015 were included to explore the determinants of the factors with the utilization. Among 1,294 older adults, 680 elders who were enrolled from January 2013 to June 2014 were followed until September 2016 to describe the outcome and the utilization. Andersen and Newman's Behavioral Model of Health Services Use was applied to guide the selection of variables, analyses, and interpretation. Based on the behavioral model, three population characteristics including predisposing, enabling and need-level factors and environmental factors were included

in the study model. Simple statistical comparison, multiple logistic regression and Cox proportional hazard model were applied in this study.

Results: Of the 1,294 participants in LTCP, 820 (63.37%) of the participants received at least one of home/community based long term care services. Among 9 types of home/community services for disable elderly, the most widely used service was homecare (57.92%) and the least used service was host family (0.37%). As for the item of home/community based long term care services utilization, 83.53% of the users used only one service. The results of logistic regression showed that elders who had lower household income level, having both geriatric conditions and having higher functional limitation were significantly more likely to use home/community based long term care services. While elders with higher education, having severe/critical disability certification, being severe cognitive impairment and unclear conscious were significantly associated with less likely to use home/community based long term care services. In addition, the use of home/community based long term care services only had a positive effect on mortality, and there were no positive impacts on nursing admission and improvement in functional status and caregiver burden.

Implications: More research is required for service utilization since diversified home/community based long term care services have not yet gained popularity in Taiwan. More promotion and education for the public to use the home/community based

services are also needed. Meanwhile, the policy about foreign worker should be reviewed and modified. Now the long term care plan 2.0 in Taiwan has been launched since 2017, future research can evaluate the effectiveness of the integrated long-term care service model.

Keywords: Long term care, Ten year long term care plan, home- and community-based services, Andersen and Newman Behavioral Model of Health Services Use, Disability

Advisor: Leiyu Shi, Dr.P.H., M.B.A., M.P.A.

Acknowledgments

I would like to extend my sincere gratitude for the many people who have helped me complete this dissertation. I would first like to thank my advisor, Leiyu Shi, for his support and guidance. He was always there ready to give me his guidance whenever I needed. I would also like to express my gratitude to my dissertation committee chair, Dr. Pien-Chien Huang, for his wisdom, guidance and kindness. He has broadened my view of policy making. I want to thank his especially for the many thought-provoking conversations we have had concerning long term care.

I would also like to acknowledge and thank my dissertation committee members: Dr. Hsin-Chieh Yeh for her expertise in epidemiology and intellectual guidance. Dr. Yea-Jen Hsu for her statistical expertise and offering her guidance and thought provoking suggestions. Dr. Hui-Chuan Hsu for her gerontological research expertise and critical thinking. Lastly, thank you to Dr. Chao Hsing Yeh providing me with both academic and professional advice.

Finally, I wish to thank my family members for their support and encouragement throughout my study. To my husband, mother and sister, thank you for your unconditional love and support throughout my journey.

TABLE OF CONTENTS

List of Tables

List of Figures

Chapter 1 Introduction

Population aging with an increasingly disabled population has become an important issue in most countries (Kato, Tamiya, Kashiwagi, Sato and Takahashi, 2009). Taiwan is no exception. The escalating growth of the elderly population and declining birth rates has accelerated the problem of aging care (National Development Council, 2016). Therefore, it is imperative for the Taiwan government to face the impact of an aging society.

1.1 Trends in Aging in Taiwan

According to the definition by World Health Organization, a society in which more than 7% of the population is over the age of 65 is known as an "aging society," 14% or higher is regarded as an "aged society," and 20% or higher is called a "super-aged society." Taiwan has become an aging society since 1993 (Ministry of Health and Welfare, 2016). The percentage of the population aged above 65 years had reached 13.20% in 2016 (Ministry of Interior, 2016). With the baby boomer generation after world war II getting older, this percentage is predicted to reach 20% by 2026 and 40% by 2061 (National Development Council, 2016); in other words, four in every ten people will be over 65 years old and one in every four people will be over 85 years old at the time.

Although the percentage of the population aged 65 and over in Taiwan is not significantly larger compared to other developed countries, the aging speed in Taiwan has overtaken U.K. and U.S., and is projected to be one of the fastest aging countries in the world. Taiwan will have progressed from an aging society to an aged society within 25 years; the growing rate is 1.6 times as much as Japan, 2.8 times more than the U.S. and 7.3 times as much as the U.K. Furthermore, it will only take 8 years to progress to a super-aged society (i.e., 20% or higher) from an aged society and the time span for this transition in Taiwan will be very short (National Development Council, 2016).

As the population ages, the prevalence of chronic disease and dysfunction will raise rapidly. The demands for long-term care services will also increase and place a heavier burden on families. According to the report of National Development Council in Taiwan, the disabled elderly will increase from 480,000 in 2015 to 950,000 in 2031 (Ministry of Health and Welfare, 2016). Taiwan's fast aging population will increase demands and opportunities for long-term care in the future, on the other hand, also present significant challenges for public healthcare policy.

1.2 Home- and Community-Based Services in Taiwan

During the past two decades, long-term care has shifted away from institutions toward home and community-based services (HCBS). This shift has been pushed by the

overwhelming desire of adults to “age in place”-that is, to receive needed assistance in their homes and communities rather than being relocated to a care facility. In response to the increased demand of this aging society and respecting individual preferences, the Taiwan government launched the 10-year Long-term Care Plan (LTCP) in 2007 which is the initiative to implement the home and community-based services (HCBS) in Taiwan.

The scope of services in the Taiwan LTCP includes: home nursing care, care services (home service, day care service and host family), home and community rehabilitation, access to assistive device services, meal services, respite care services, transportation services, and institutional services (Executive Yuan, 2007). Although Taiwan LTCP includes institutional services, it is mainly for low-income and serious disable elderly. The aim of LTCP is to assist the elderly to live independently in their homes and to maintain or enhance their quality of-life.

Recent studies have indicated a shift trend towards home- and community-based care (Wysocki et al., 2015). In Taiwan, study also showed that about 80% of the elderly prefer home- or community-based care (Chung et al., 2008). The 10-year LTCP is the pilot program to set up home- and community-based services (HCBS) in Taiwan. Its ultimate goal is “aging in place”. How the elders continue to remain in communities and what kinds of home and community based services used by them are intriguing and

worth further examination. Therefore, more research investments and supportive policies are required in order to achieve this goal.

1.3 Significance and Study Purpose

The issues and questions stated above point to the importance of research in the field of home and community-based long-term care services for the elders in Taiwan. As the Taiwan government is accelerating the development of long-term care (LTC) services, it is important to improve the understanding of the factors that affect LTCP utilization and the receptor's outcomes especially in home and community-based services (HCBS). In order to explore the factors related to the LTCP utilization, Andersen's Behavioral Model of Health Services Utilization was used to guide the study to understand the utilization by community dwelling dependent elderly in Taiwan. Such understanding will provide insights into characteristics of participants who used the LTCP, provide ways to assist nonusers, help to obtain accurate forecasts on future needs and develop policies to alleviate the pressure on health care budgets caused by aging populations.

Specifically, the aims for this study were as followings.

1. To understand the utilization of home- and community-based services in Taiwan and factors associated with the utilization in Taiwanese community dwelling dependent

elderly.

2. To examine the outcome changes on the elderly who received home-and community-based services
3. To examine the effects on burden in caregivers of the elderly who received home-and community-based services

The chapters that follow provide a detailed description of every step taken in this study, as well as my findings and recommendations. Chapter 2 focuses on related literature and the development of Taiwan long term care system that helped to define its scope. Chapter 3 outlines the research methodology, including the databases, data collection, data analysis tools, and analytical methods I employed to generate the findings. Chapter 4 is the analytical results of this study. Finally, Chapter 5 provides a discussion of the dissertation as a whole and provides direction for policy implications as well as future research.

Chapter 2 Literature Review

Along with the development of medical technology, the improvement in the health care delivery system and the prolonging in life expectancy, population ageing is widespread across the world. This phenomenon is also a great challenge for health care systems. As the rapid ageing of the population, the prevalence of disability, frailty, and chronic diseases are expected to increase dramatically, causing the increasing demands for long-term care services. This chapter of the literature review was organized in the following manner. First, the literature that grappled with an operational definition and type of long term care services. Second, the history and development of long term care in Taiwan were reviewed. Third, literature that examined the factors and effects associated with HCBS utilization. Lastly, the conceptual framework for the study based upon Andersen's Healthcare Utilization Model (Andersen, 1968, 1995), specifically Andersen's Behavioral Model of Health Service.

2.1 Long-Term Care

As defined by Kane, Kane and Ladd (1998), long-term care is "assistance given over a sustained period of time to people who are experiencing long-term inabilities or difficulties in functioning because of a disability" (p. 4). The aim and the service providing for long term care are very different from acute health care. Acute health care

is designed to treat and/or cure an acute condition which is usually offered in a doctor's office or in a hospital. Long-term care, playing a rehabilitative and compensatory role in the daily lives of those with chronic functional disabilities, includes skilled, therapeutic as well as personal care services and provides supports that may be needed by a disable person. In summary, the primary goal of acute care is to return an individual to his or her previous functioning level, while long term care aims to prevent deterioration and help people maximize their independence and functioning (McCall, 2001).

Long-term care service (LTCS) was designed to compensate the individual's functional impairments, which covers a variety of health, personal care, and support services that people need when they have chronic illnesses or disability and cannot care for themselves for long periods of time (HHS, 2015). These services include hands-on, direct care as well as general supervisory assistance which help people live as independently and safely as possible when they can no longer perform everyday activities on their own. Most long-term care services provide assistance in activities of daily living (ADLs) or instrumental activities of daily living (IADLs). ADLs are essential for an individual's self-care which include eating, bathing, toileting, dressing, transferring, and ambulating. IADLs are more advanced activities necessary for independence in the community which include financial management, medication

management, transportation use, meal preparation, shopping, housework, and using of telephone (Noelker & Browdie, 2013).

2.1.1. Types of Long Term Care Services

Based on different providers and setting, long-term care can be classified into formal or informal, institutional or home-and/or community-based services. Formal care means that long term care services provided by a range of agencies such as governmental organizations, NGOs or by the private sector. It is usually provided by trained, licensed and qualified professionals and auxiliaries, such as personal care workers (who help with bathing, dressing, etc.). Informal care is usually provided by family members, close relatives, friends or neighbors who are non-professionals and not trained (WHO, 2000).

Long term care can be provided through a wide variety of settings, such as recipients' homes, adult daycare center, adult foster care, community rehabilitation center, and institutions such as congregate housing, assisted living facilities, and nursing home. Below are described services that are included in these three main types of long term care: home-based services, community-based services and facility-based services.

Home-based services

Home-based services are provided within the homes of frail and home-bound elderly. The services address the health and social needs of the elders to help them stay

at home while living as independently as possible and support families in the care of their seniors (National Institutes of Health Senior Health, 2015). Home-based services involve assistance with the basic personal tasks of everyday life or other assistance with everyday tasks, such as eating, toileting, bathing, dressing, grooming or assistance with housekeeping, chores and meal preparation, taking medications, and supervision to ensure safety of the elderly. These services can be provided by an unpaid caregiver such as a family member or a friend. Also, these services can be provided by paid caregivers, such as nurses, home health or home care aide, therapists, and homemakers. Such services include home nursing care, rehabilitation services, homemaker services, friendly visitor/companion services, and emergency response systems (National Institutes of Health Senior Health, 2015).

Community-based services

Similar to home-based services, community-based services can help people who are cared for at home-and their families. These services can be given at home or at a location in the community. Some programs are limited depending on the level of disabilities. These services include adult day care service, transportation services, meals programs, senior centers and respite care etc. (National Institutes of Health Senior Health, 2015). These can help people who are cared for at home-and their families.

Facility-based services

Facility-based services typically provide living accommodation for people who require 24 - hour on-site supervised care, including professional health services, personal care and services such as meals, laundry and housekeeping. These facilities include assisted living facilities, nursing homes, group homes, and continuing care retirement communities. Some of these facilities only provide housing and housekeeping, but many also provide personal care and medical services (Health Canada, 2015; National Institutes of Health Senior Health, 2015).

2.1.2. Home and Community-Based Services

Most older adults prefer to age in their own homes (deJong et al., 2012; Vasunilashorn et al., 2012). Base a report by AARP, 90 percent of older adults aged over 65 report that they would prefer to stay in their current residence as they age. Over time, the goal of aging in place has become the common goal over the world. Many countries began to rethink their healthcare and long term care policy to satisfy the needs of older populations. Home- and community-based services (HCBS) programs were implemented in many countries to provide assistance to individuals with disabilities and their caregivers so that they could continue to live independently in the community (Alkema et al. 2006; Gaugler, 2014). Typical HCBS include adult day care, personal

care, home health care, respite care, transportation, nutrition, and other supportive services.

Many studies have reported various benefits by using HCBS. For example, use of a home and community-based services (HCBS) has shown to increase the odds of older adults remaining in the community (Chen and Thompson 2010). Research has also found that the appropriate HCBS use could delay institutionalization of care-recipients (Pande, Laditka, Laditka, & Davis, 2007) and reduce the risks for hospital admissions (Xu et al., 2009). Studies also have found that older adults and their caregivers with unmet HCBS needs in the community are more likely to have health problems and medical needs (Sands et al., 2006); institutionalization (Chen & Thompson, 2010; Gaugler, Kane, Kane, & Newcomer, 2005); and emotional strain (Li, Chadiha & Morrow- Howell, 2005) and depressive symptoms (Choi & McDougall, 2009).

Older Adults who use the Home and community-based services (HCBS) have increased dramatically over the past decades. In the USA, HCBS has accounted for all Medicaid LTSS growths in recent years while institutional service expenditures have been flat. The number of Medicaid HCBS participants increased from 2.3 to 3.2 million between 2002 and 2012 and the Medicaid HCBS expenditures for state plan home health services, state plan personal care services, and §1915 (c) waivers increased from $25.1 billion to $55 billion (Ng, Harrington, Museumeci, & Reaves, 2014). In Taiwan, the use

HCBS among older adults who lost functional ability has risen from 2.3 percent in 2008 to 34.5 percent in 2015, which is a 14.2-fold increase (Ministry of Health and Welfare, 2016). The increasing size of HCBS recipients also implies the desire to "age in place".

In OECD countries, to respond most people's preference to receive LTC services at home, many countries have implemented programs and benefits to support home-based care for older adults over the past decade. The proportion of LTC recipients aged 65 and over receiving long term care at home has increased between 2003 and 2013, with particularly large increases in France (20.5%), Sweden (14.6%) and Korea (11.9%) (OECD, 2015). In France, the government has adopted a multi-year plan to increase home nursing care capacity to 230, 000 by 2025; while Sweden has reduced its institutional core capacity in an effort to encourage community care (OECD, 2015).

Japan has the highest percentage of elders in the world. To address this issue in Japan, the Japanese government introduced a Long-Term Care Insurance System for the elderly in April 2000. The main purposes of this system were to promote independent living of the elderly in the community, to share the caring burden of society, and to decrease the caregiving burden on family members (Olivares-Tirado, P., Tamiya, N., Kashiwagi, M., & Kashiwagi, K., 2011). There were seven levels of certification under Japan Long-Term Care Insurance, the two lightest levels were "assistance required", those certified in these two levels could only use community care or preventive services,

to help them to live independently while maintaining their present physical condition as long as possible. The home-based, community-based, or institutional care services were provided if the elder's care levels were the remaining five levels refer to "care required" (Olivares-Tirado et al., 2011; Oyama et al., 2013).

Follow by Japan, the Korean government introduced national long-term care insurance (NLTCI) in July 2008 (Kim et al., 2013). The Korean NLTCI provides mainly in-kind benefits in principle at home or in LTC institutions. The benefits of the LTCI are provided according to the care needs which are evaluated using a 52-item screening tool and a scoring system based on a computer algorithm. Home care benefits include home help, home bathing, home nursing, day/night care, and short-term care. Residential care benefits consist of caring in facilities and group homes (Won, 2013). The HCBS use in Korean was relatively low compared to OECD countries, the usage of HCBS was 47.9%, as compared to 52.1% of institutional care in 2014 (Kim, 2015).

2.2 Long-Term Care Development in Taiwan

2.2.1. Demographic Transition in Taiwan

A demographic shift is underway in Taiwan, in which old age and low birth rate are redefining the societal structure. Taiwan has 23.5 million people while 13.1 percent are currently 65 or older, and it is projected to increase to 40 percent by 2061 (National

Development Council, 2016). However, the birth rate in Taiwan is very low with 1.20 children being born to every woman, which resulted in decreasing the proportion of young population and increasing the proportion of elderly population (Ministry of Health and Welfare, 2016). According to the report by National Development Council, the population will shift from naturally increasing to naturally decreasing in 2017. The proportion of old-age population will exceed that of young-age population and continue to rise. Thus, fewer young people need to take care of the increasing elderly. In 2016, there are approximately 5.6 people in their prime to support one elderly person; by 2060, the number will have fallen to 1.3 people in their prime to support one elderly person. Meanwhile, life expectancy is high, at 76.27 years for men and 82.17 years for women which has also prolonged the length of time that older adults are likely to require long-term care. (Ministry of the Interior, 2016). According to the national statistics, Taiwan already has 338,000 people with long-term care needs and of which, 53.9% are seniors above the age of 65 years (Ministry of Health and Welfare, 2014).

Traditionally, women and family play important roles in long-term care services in Taiwan. However, family structure has undergone noteworthy changes that weaken the function of family care in Taiwan society. The elderly people can hardly rely on family support. According to the report of the Senior Citizen Condition Survey, the percentage of single elder households has risen from 9.2% in 2009 to 11.1% in 2013 and the

percentage of elderly couple households has risen from 18.8% to 20.6% (Ministry of Health and Welfare, 2014). In addition, the population of individual households in Taiwan has decreased from 5.57 people per household in 1961 to 2.75 people per household in 2016 (Ministry of the Interior, 2016). Hence, the country will be facing the challenge of providing support for a substantial population with LTC needs.

2.2.2. Long Term Care Policy in Taiwan

To cope with an aging population, Taiwan government began to set up a long term care scheme. A three-stage program has been established. The first stage was launching a "National Ten Year Long-term Care Plan" at the end of 2007, which was the country's first comprehensive care initiative. This plan offers services to three kinds of people: 1) people age over 65 with functional limitation on daily living, 2) people over the age of 50 who possess disability identification, and 3) aboriginal people over the age of 55. (Taiwan Executive Yuan, 2007). Under this plan, the applicants receive and pay copayment for such services based on their degrees of disability and household income level. The general co-payment is 30%, however, the low income person were exempted from co-payment. The overall goal of the program is to establish a long-term care system to guarantee suitable services for the mentally and physically disabled, to improve independent living ability, to promote quality of life, and to maintain dignity and

autonomy. In addition, to help disabled citizens “aging in place,” the program offers supports to family caregivers, helps build a care management system, and develops human resources, service options and a financial framework (Taiwan Executive Yuan, 2007; Wang & Tsai, 2012). The second stage was implementing the Long Term Care Service Network Plan and legislating the Long Term Care Services Act. This stage was to promote the development of diversified long term care services especially in remote areas, and fostered a universal service network that brings LTC services to communities throughout Taiwan. In November 2015, the “Long-term Care Capacity and Capability Plan” was put into motion to provide a bridging plan for “ 10-year Long-term Care Plan”. This was the second stage. This stage was to continually increase long term care capacity. In June 2015, “The Long-term Care Services Act” was announced in order to integrate a long term care system providing long term care services, and to ensure the quality of care. This act will be fully implemented in June 2017 (Ministry of Health and Welfare, 2016).

To provide better services for social and health care, the long-term care management center (LTCMC) was established by local governments. Every county in Taiwan has at least one center for beneficiaries and these centers act as administrative centers for local service delivery. When applicants contact their local centers, a care manager will go to their home to perform an assessment and develop a care plan. The

centers then contract care providers to offer a variety of services and monitor the services quality. (Taiwan Executive Yuan, 2007).

"National Ten Year Long-term Care Plan" included seven home and/or community-based services in addition to institutional care. These services include home care, home nursing, home/community-based rehabilitation, respite care at home or in institution, meal services, reimbursement and rental of medical auxiliaries/equipment, transportation services and long-term care institution services (Taiwan Executive Yuan, 2007). The institutional service is only for low income households with severe disability. Up to the end of 2015, over 160,000 people had received the services provided by LTCP and 2788 long-term care institutions had provided care services under the principles of LTCP. Usage among the elderly who lost functional ability rose from 2.3 percent in 2008 to 34.5 percent in 2015, which is a 14.2-fold increase.

In 2017, the Taiwan government starts “Long-term care services program 2.0”, which is a revised edition of the original LTCP, and it will create an integrated community-based care system that promotes “aging in place” and offers diverse and flexible options to meet long-term care needs. Besides, it would expand the population eligible for long-term care services by 40 percent while establishing a nationwide network of care centers at the local level. In “10-year Long-term Care Plan” stage, the government has been enhancing its LTC services’ capacity and capability by developing

HCBS models that help the elderly “age in place”. The government has also established “Long Term Care Management Center” in every county to integrate health and social care to facilitate the development of the LTC sector and promote care integration in Taiwan. The LTCP 2.0 is designed to integrate local community with an ultimate goal to establish a broad spectrum of continuous care, from preventive health care to community-based support services, and late-life hospice care. This LCTP 2.0 will include a three-tier system, i.e., (1) community-based integrated service centers, (2) combination of day care and service centers, and (3) long-term care stations within communities. The LCTP 2.0 aims to provide a high-quality, affordable and accessible system will allow disable people to obtain long-term care services with dignity as well as foster a compassionate society that respects and cares for all of its senior citizens. (Taiwan Executive Yuan, 2017).

The “Long-term care plan 2.0” provides for three new measures, as follows (Taiwan Executive Yuan, 2017):

- First, the government begin to establish three levels of service centers around Taiwan, which includes “community-based integrated service centers” (level A), “complex daytime service centers“ (level B), and “lane and alley long-term care centers” (level C).
- Second, the types of services available at these centers increased from 8 to 17. These

services are from preventative health care to community-based support services, and late-life hospice care such as preventative care, dementia support, and hospice home care.

- Third, the number of care recipients will increase by expanding coverage to include people over the age of 50 with dementia, disabled persons under the age of 49, disabled indigenous residents over 55 who live in low-lying areas, and frail seniors over 65. The care recipients will increase from about 511,000 to 738,000.

In summary, “10-year long-term care 2.0 plan” try to create an integrated community-based care system by devoting more resources to various levels and types of community-centered services that promotes “aging in place” and offers diverse options to meet long-term care needs. Under the scheme, the elderly and disabled can get long term care services conveniently and live with dignity in their communities.

“Ten Year Long-term Care Plan 1.0 " did a good job of setting up an initial long-term care infrastructure in Taiwan. “The Long-term Care Plan 2.0 will further facilitate the integration of social care, medical care and preventive health resources. The success of these plans is a critical factor behind the government’s drive to push for the creation of a national long-term care system and it will allow senior citizens to live in a familiar environment and age in place.

2.2.3. Long Term Care Resources in Taiwan

The rapid population aging in Taiwan is accelerating the long-term care needs. To facilitate the development and distribution of long term care resources, “Long Term Care Service Network Plan” and the legislating of “ Long Term Care Services Act” were implemented. The former plan divides Taiwan into 22 broad areas, 63 subregion, and 368 small LTC regions based on service needs. It includes incentives for resource development and focuses on community based as well as localized resource development. Therefore, in areas with insufficient resources, the focus is to subsidize the establishment of institutions by private organizations. In areas with sufficient resources, the focus was to provide the guidance and improvements needed for raising service quality. The legislation of “ Long Term Care Services Act” provides a framework for management and the integration of different types of long-term care services, which includes institutional residency; home care; community care; family caregiver support services, etc..

In December 2014, there were 105,449 beds available at LTC institutions, including 38,249 beds at general nursing homes, 59,280 beds at LTC institutions and domiciliary care institutions, and 8,200 beds at veterans’ homes. There was an increase of 23 percent from 2008. The number of beds per 1,000 disabled population was 248.7 (Ministry of Health and Welfare, 2016). Moreover, there were 2,788 institutions

offering home- and community-based long term care services such as home services, day care services, household entrusted services, elderly nutritious meals, transportation services, home nursing, community and residential rehabilitation, and respite care services (Tables 1). Their service capacity is 197,951 people (Ministry of Health and Welfare, 2016).

Table 1 Home- Care and Community-Based LTC Care Development in Taiwan

Unit: Institution

Item/Year	2008	2009	2010	2011	2012	2013	2014
Home Service	124	127	133	144	149	160	168
Day Care Services	31	39	66	78	90	120	150
Foster Care	4	16	23	16	17	20	22
Elderly Nutritious Meals	166	204	201	159	169	190	209
Transportation Services	31	42	43	39	43	42	41
Home Nursing	487	495	489	451	498	478	486
Community and Residential Rehabilitation	62	88	113	112	111	191	143
Respite care Services	102	114	311	474	527	651	1549
Total	1007	1125	1379	1473	1604	1852	2788

Manpower is the key factor to build a long-term care service delivery system. At the end of 2014, there were 44,285 service providers, including 26,942 home service care workers, 10,826 nurses, 3,439 social workers, 1,987 physical therapists and 1,091 occupational therapists working in long term care industry. (Ministry of Health and Welfare, 2016).

2.2.4. Long Term Care in Chiayi City

Chiayi City, located in the southern of Taiwan with more than 270,000 residents, is the very first city to provide home- and community-based long term care services in Taiwan. In Chiayi City, the proportion of elders age 65 is 12.74 percent in 2015 and the disable elderly was estimated to be about 3,304 in 2014 (Chiayi City Government, 2015). There are 16 types of home- and community- based services provided in Chiayi City, including nursing home, home care, foster care, day care, dementia day care, GPS locator, user profile bracelet, emergency rescue service, home nursing care, in-home rehabilitation services, physician visiting, pharmacist visiting, mobile shower bath**,** transportation services, meals programs, reimbursement and rental of medical auxiliaries/equipment and respite care. The coverage rate of home and community based long term care services among the disable elderly was about 40%. Chiayi City is the city with the most varieties of HCBS services in Taiwan. In 2014, there were 27 LTC institutions with 2,015 beds and 34 institutions offering home- and community-based long term care services (Long Term Care Management Center, 2015).

2.3 Andersen's Behavioral Model

This section addresses the conceptual framework for the study based upon Andersen's Healthcare Utilization Model (Andersen, 1968, 1995), specifically

Andersen's Behavioral Model of Health Service. I describe the variables within the model, how they relate to the study, and relevant literature.

Andersen's Behavioral Model (ABM) is one of the most well-known and widely used model in explaining healthcare utilization (Babitsch & Gohl, 2012). This model also has been used frequently in studies of long-term care (Bradley, McGraw, Curry, Buckser, King, Kasl, & Andersen, 2002). Andersen created the original behavioral model of health services in 1968, and it has been expanded and modified thoughout the years. The model's unit of analysis originally was the family, and it later shifted to the individual in order to take into account the potential heterogeneity of family members (Andersen, 1995). The initial model contains three sets of predictive factors: predisposing, enabling, and need factors (see Figure 1). It assumes that a sequence of factors determines the utilization of health services: the predisposition to use services, the ability to use services and the need to use services.

(1) Predisposing factors refer to socio-demographics (e.g. age, gender, race, and marital status), social structural variables (e.g. education, religion, etc.,) and health beliefs.

(2) Enabling factors include resources found within the family and the community, such as household income and insurance coverage.

(3) Need factors are conditions that give rise to the need for service use including

subjective health status and objective health status (Andersen, 1995; Andersen & Newman, 2005; Babitsch, Gohl, & von Lengerke, 2012; Bradley et al., 2002).

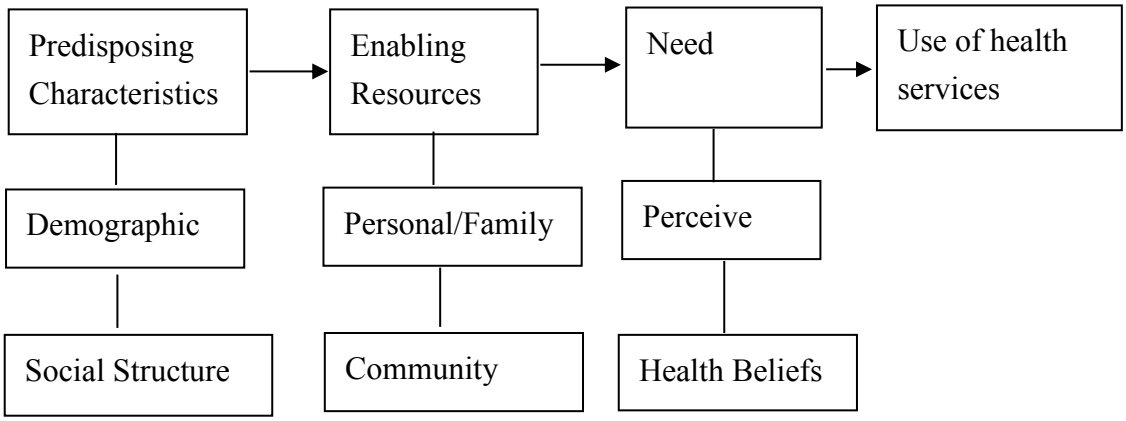

Figure 1 Andersen's Behavioral Model of Health Services Use

In the 1970's, Aday and other collaborators expanded and refined the Andersen's model including the health care system. The national health policies, resources, and organizations in the health care system are important determinants of the population's use of services throughout the years. In addition, the refined model also extended the outcome of interest beyond utilization to consumer satisfaction. Furthermore, the model emphasized that both type of service available and the purpose of the health care service will determine the type of service utilized. Thus, different type of health care services will have different determinants based on characteristics of the population and the health services (Andersen, 1995; Andersen & Newman, 2005).

During the 1980's -1990's, Andersen's model was again revised. Andersen

included the external environment as an important component for understanding health service utilization. This model also took into account health behavior and formed three components with a linear relationship: primary determinants of health behaviors, health behaviors, and health outcomes. Primary determinants of health behaviors include characteristics of the population, the health care system, and the external environment (including physical, political, and economic components), which are the direct cause of health behaviors. Health behaviors include personal health practices and the use of health services that determine health outcomes. Health outcomes include perceived health status, evaluated health status, and consumer satisfaction which are directly affected by health behaviors. This model extends the measures of access (health status, consumer satisfaction) which are particularly important for health policy and health reforms (Andersen, 1995). In the 1990's, Andersen and his colleagues showed a final emerging model which emphasizes the dynamic and recursive nature of health services. This model includes feedback loops showing that outcome, in turn, affects subsequent predisposing factors and perceives needs for services as well as health behavior (Andersen, 1995).

In summary, Andersen's model (Andersen, 1995) fits this study well because it allows a rich understanding of the elder as a holistic person, encompassing the many aspects that affect their health care utilization from their care needs. Moreover, it allows

for the understanding of the population and how the environmental system and policy factors affect elders and outcomes reached.

2.4 Factors Affecting Home and Community-Based Long Term Care Use

Following the behavioral model of health service use of Andersen (1995), I distinguished three categories of individual determinants and one environmental category of home- and community-based services utilization: predisposing, enabling, need and environmental determinants.

Predisposing factors

Predisposing variables refer to individual characteristics that exist prior to the onset of specific episodes of illness (Dorin et al., 2014.). These variables include demographic variables, socioeconomic status, which may help identify the individual's propensity to use home and community based LTC services. In general, age, gender, and level of education have been reported to affect seniors' use of long term care services based on the literature review (Dorin et al., 2014; Kim, Kwon, Yoon & Hyun, 2013; Meijer, Koopmanschap, Koolman & Doorslaer, 2009, 2011; Tsai & Lai, 2011).

Age. Age is a biological predisposing factor. Significant associations between age and utilization of long term care services were found in the majority of the studies. Higher age was found to be associated with the use of long-term care (Dorin et al.,2014;

Kim et al.,2013; Ku, Liu &Wen, 2013; Meijer et al., 2009, 2011; Rodriguez, 2013; Tsai & Lai, 2011; Wu, Hu, Huang, Fang, Chou, & Li, 2014). In general, aging increases the risk of suffering from one or more chronic conditions, and often causes dependency and a necessity for assistance in daily life. Therefore, it increases the possibility of long-term care utilization.

Gender. Females were found to be more likely than males to use HCBS (Hoi, Thang & Lindholm, 2011; Ku et al. 2013; Lee, Shannon & Brown, 2015; Rodriguez, 2013; Wong, Groot, Polde & Exel, 2010). Such difference may result from the fact that men are less likely to live alone because women in many countries marry men older than themselves (Blomgren, Martikainen, Koskinen & Martikainen, 2008). Therefore, they do not have the chance to receive care from their partners (Rodriguez, 2013). However, Bookwala et al. (2004) found that sex was uncorrelated with formal service utilization. Blomgren et al. (2008) also found that there were no significant differences between genders in the adjusted levels of receipt of formal help. The findings with respect to gender on long term care service used by the elderly is not consistent.

Marital Status. Research study findings about the effect of marital status on HCBS use were not consistent. Krout (2000) found that both married and unmarried elderly used a similar amount of different community services. Li, Fann & Kuo (2009) stated that marital status was significantly associated with the use of rehabilitation services.

Wu et al. (2014) found that being single was significantly associated with greater long-term care use.

Enabling Factors

Enabling determinants are those resources that support or impede use of health care service which may be indicated by personal resource variables and community resource variables (Andersen & Newman, 2005). In this study, enabling factors were resources that enable elders to remain at home or in communities which include household income level, education, insurance, living status, which is considered to be important as it affects access to LTC.

Education. The effect of education on health service used by the elderly is not consistent between the various study findings. Study in Singapore showed that higher education was associated with higher odds ratios for use of referred community long-term care services (Wee et al., 2014). Bookwala et al. (2004) and Ku et al. (2013), studying community based long term care services, also found that elders with more education were correlated with use of more formal services. However, Alkema et al. (2006) found that elders with higher education were less likely to use any HCBS. Wu et al. (2014) found that education level was not significantly associated with long-term care use.

Income. The ability to pay for health care is relevant to elder's utilization of

services. Literature demonstrates that income level has a positive influence on home or community based long term care services. A longitudinal survey for the use of LTC in Singapore showed that higher education and household income were significantly associated with the use of community-based long-term care services (Wee, Liu, Goh, Chong, Aravindhan & Chan, 2014). A study of community dwelling dependent elderly in Spain also showed that higher monthly household income increased the likelihood of receiving informal or mixed home care (Rodriguez, 2013). However, some studies have reported higher LTC utilization by lower income people or showed no significant association between LTC utilization and income. Kim et al. (2013) studied utilization of long-term care services among older LTCI beneficiaries in Korea and found that LTC users were more likely to have a lower income. Wu et al. (2014) reported that household monthly income was not significantly associated with long-term care use in Taiwan.

Insurance. Health insurance also has positive influence on home care utilization. Previous studies indicate that Medicaid insurance increased the likelihood of home care services utilization. Research in Korea indicates that insurance and income were important predictors for the use of long-term care services (Kim et al., 2013).

Community resource. Availability of both formal and informal supports was identified to have direct effects on use of long term care (Andersen, 1995). A study of formal and informal use in Spain showed that elderly living in a capital area decreased

the likelihood of receiving informal care but increased the likelihood of receiving formal care. This study pointed out that the level of care provision varies across municipalities which would affect the LTC utilization (Rodriguez, 2013). Moreover, studies indicated that regional differences in utilization were due to variations in the supply of LTC options: number of nursing home beds, number of available slots for alternative LTC services, or both (Borrayo, Salmon, Polivka & Dunlop, 2002).

Living status/ having a primary caregiver. Being single and living alone are associated with greater long-term care use (Hoi et al., 2011; Wu et al., 2014). A study by Sands et al. (2012) showed that those living with others receive fewer HCBS than those who live alone, and those living with an informal caregiver receive fewer HCBS than those without. Research also suggested that co-residence or living with others is important in determining the use of community based resources (Rodriguez, 2013). In addition, primary family caregivers have a high impact on service utilization (Dorin et al., 2014).

Need Factors

In Anderson's utilization model, need factors address perceived and evaluated needs. Perceived need is defined as how one views his or her own general health which may result from illness or from aging-related functional disabilities, whereas evaluated need is a professional assessment on an individual's health (Andersen & Newman,

2005). Need factors are found to have a larger effect on LTC use than socio-economic and demographic differences, and are referred to functional, health and cognitive deficits. In the current study, needs are defined as the needs reported by seniors themselves, including self-reported disability, geriatric condition and chronic diseases, special care, conscious, and cognitive impairement.

Functional limitation. Studies have consistently reported that the level of functional disability has positive association with long term care utilization. Functional disability among the elderly is generally assessed by impairments in ADL which is a key indicator for long-term care services (Tsai et al., 2011; Wu et al., 2014). In the literature, disability factors are key factors for use of home- and community-based long term care services and for older adults' ability to live in communities (Akamigbo & Wolinsky, 2006; Johnson & Wolinsky, 1996). The elderly with more ADLs impairments are positively associated with the receipt of either formal or informal help (Ku, Liu & Wen, 2013). A study about formal home care utilization shows that adults with activities of daily living (ADL) deficits, instrumental activities of daily living (IADL) deficits, and physical limitations have significantly higher odds of use of formal home care, as did persons with arthritis, diabetes, and heart diseases (Mcauley, Spector & Nostrand, 2009). Study in Netherlands also found that respondents who have difficulties with instrumental activities of daily living (IADL), ADL and mobility, have higher probability of using

homecare (Wu et al., 2014). In addition to disability, mobility problems and hospitalizations are associated with higher probability of using homecare (Meijer et al., 2009).

Geriatric condition/chronic diseases. Study has reported that the geriatric condition has positive association with HCBS utilization. The elderly with incontinence were more likely to use any HCBS (Alkema et al., 2006; Borrayo et al.,2002).

To sum up, previous studies show that age, gender, and marital status may be predisposing factors for the use of home and community based long term care services. The enabling factors include monthly household income, health insurance, education, co-residence with family members, and availability of informal support. ADL, IADL, mobility problems, hospitalizations and number of chronic diseases are all need factors associated with the utilization of home and community based long term care.

2.5 Effect of Home- and Community-Based LTC Services Utilization

Literature show that the effects of home and community-based LTC service utilization include reducing mortality, nursing home admission, hospitalization, and ER visits, as well as improving mental health and functional ability (Akamigbo & Wolinsky, 2006; Albert et al.,2005**;** Dalby et al.,2000; Koike & Furui, 2013; Ku et al.,2013; Mcauley et al.,2009; Muramatsu, Yin & Hedeker, 2010). Recently, a variety of home-

care interventions demonstrate survival benefits for vulnerable elders. For frail elderly people, preventive home visits by nurse result in a lower combined risk of death and nursing home admission (Akamigbo & Wolinsky, 2006). A study in New York City's Medicaid Home Care Services Program also shows that the use of Medicaid home care service is associated with a significantly reduced risk of death in people with disability in activities of daily living (Ku et al., 2013).

Elders received HCBS users had positive outcomes on care need level, functional status, and mental health. The study of long-term care service use and care-need level in Japan reported that home-based long-term care service use may prevent an increase in care need level (Mcauley et al.,2009). In the United State, HCBS recipients had positive outcomes, including improved function, increased outpatient service use, and decreased depression (Albert, Simone, Brassard, Stern& Mayeux, 2005; Dalby et al., 2000). In addition, the study of "Aging in Place" program (AIP)" in Missouri showed that "Aging in Place" group had better outcomes on cognition, depression, ADL and incontinence than nursing home group (Marek et al.,2005). A longitudinal study in Missouri also showed that participants in the HCBS program had better improvements in cognition, depression, ADL, incontinence compared to the matched cohort of nursing home residents (Koike & Furui, 2013).

HCBS users are more likely to have lower rates of hospitalization and nursing

home admission (Miller, 2011;Pande, Laditka, Laditka & Davis, 2007; Sands et al. ,2012; Xu et al. 2009). A national analysis on Medicaid population reported that HCBS users are more likely to have avoidable hospitalization than non-HCBS counterparts among Medicaid beneficiaries in the U.S (APS, 2005). A comprehensive report by American Journal of Public Health (AJPH) found that increased state-level expenditure on HCBS led to lower rates of nursing home use from 2000 to 2007 for many states (Miller, 2011). Segelman et al. (2017) studied the HCBS spending and nursing home admissions for 1915(c) waiver enrollees and found that the enrollees with higher HCBS spending had a lower risk of long-term nursing home admission and greater functional impairment at nursing home admission compared to waiver enrollees with lower spending. In addition, Kane et at (2013) accessed the HCBS use on nursing home use and found that there was a substantial increase in HCBS use and a modest decrease in nursing home use. The HCBS did care for the elders who might otherwise have used nursing homes, however, the increase in services exceeded the decrease in nursing home use and resulted in a net increase in expenditures. Xu et al. (2009) showed that a greater volume of attendant care, homemaking services and home-delivered meals are associated with a lower risk of hospitalization. Sands et al. (2012) concluded that a greater volume of HCBS for an individual is associated with reduced risk of nursing-home placement. Study in Japan also showed that users of home and community-based

services were less likely to be hospitalized or institutionalized than non-users (Tomita, Yoshimura & Ikegami, 2010).

Inconsistent findings of the outcome are found, such as in reduction of functional decline, mortality rates and institutionalization rates in community-dwelling elderly persons (Beswick et al., 2008; Konetzka, Karon & Potter, 2012; Marek, Popejoy, Petroski, Mehr, Rantz & Lin, 2005). A review of home and community-based services versus institutional care summaries that the rate of change in physical function did not differ between AL and NH residents. In addition, a systematic review of preventive home visit programs by Huss et al. (2008) concluded that there was no statistically significant difference in nursing home admission, functional status decline, and mortality. Bouman et al.(2008) reported that there is no difference in the use of health services between "home visiting program" intervention group and control group. Mayo-Wilson et al. (2014) reported that home visiting is not consistently associated with differences in mortality or independent living, and investigations of heterogeneity did not identify any programs that are associated with consistent benefits.

Based on the above studies, the effects on functional status, mortality rates, nursing home admission and hospitalization are still inconsistent.

For the HCBS use on caregiver's burden, Hong and Casado (2015) pointed out that using HCBS can alleviate caregiver stress, a review study also concluded that respite

and support service as well as day care centers have the potential to reduce the caregiver burden, and increase their motivation towards their role as caregivers (Tretteteig, Vatne & Rokstad, 2016).

Chapter 3 Methodology

3.1 Conceptual Framework

The objective of this study is to understand the factors associated with home- and community-based long-term care services utilization and to examine the effects on the elderly who have accepted such services. The Behavioral Model of Health Services Use developed by Anderson and Aday in 1995 (Anderson, 1995) was used to guide this study and to help select variables for analyzing the relationships between older adults' characteristics, the utilization of home- and community-based services and lastly, their outcomes.

Based on the behavioral model, I distinguish population characteristics as three categories of determinants of HCBS utilization: predisposing, enabling and need-level determinants. Moreover, environmental factors are included in the model. In this study, I hypothesize that older adult's HCBS utilization is a function of 1) their predisposition to use services; 2) factors that enable or impede their use of services; 3) their need for services; 4) environment factors to use services. The HCBS receptor's outcome is the function of HCBS utilization plus the three population characteristics mentioned above.

In this study, predisposing factors include age, gender, and marital status. Enabling factors include education, social welfare identity, living arrangement, having primary

caregiver, and household monthly income. Need factors include geriatric conditions, number of chronic diseases, conscious, functional limitation, special care need, and cognitive abilities. Geriatric conditions include urine or stool incontinence. Chronic diseases are physician-diagnosed diseases including hypertension, diabetes, stroke, heart disease, cancer, dementia, etc. Environmental factors refer to HCBS resources and medical resources in community by different year. Outcome examination include mortality, nursing home admission rate, change in caregiver's burden, and change in functional status.

Figure 1 displays the indicators selected for each of the four dimensions. The model posits that elder adults' use of home- and community-based services is a function of (a) their predisposition to use services, (b) factors that enable or impede their use of services, (c) their need for services and (d) environmental factors. The receptor's outcome is the function of HCBS utilization plus the three population factors as mentioned above.

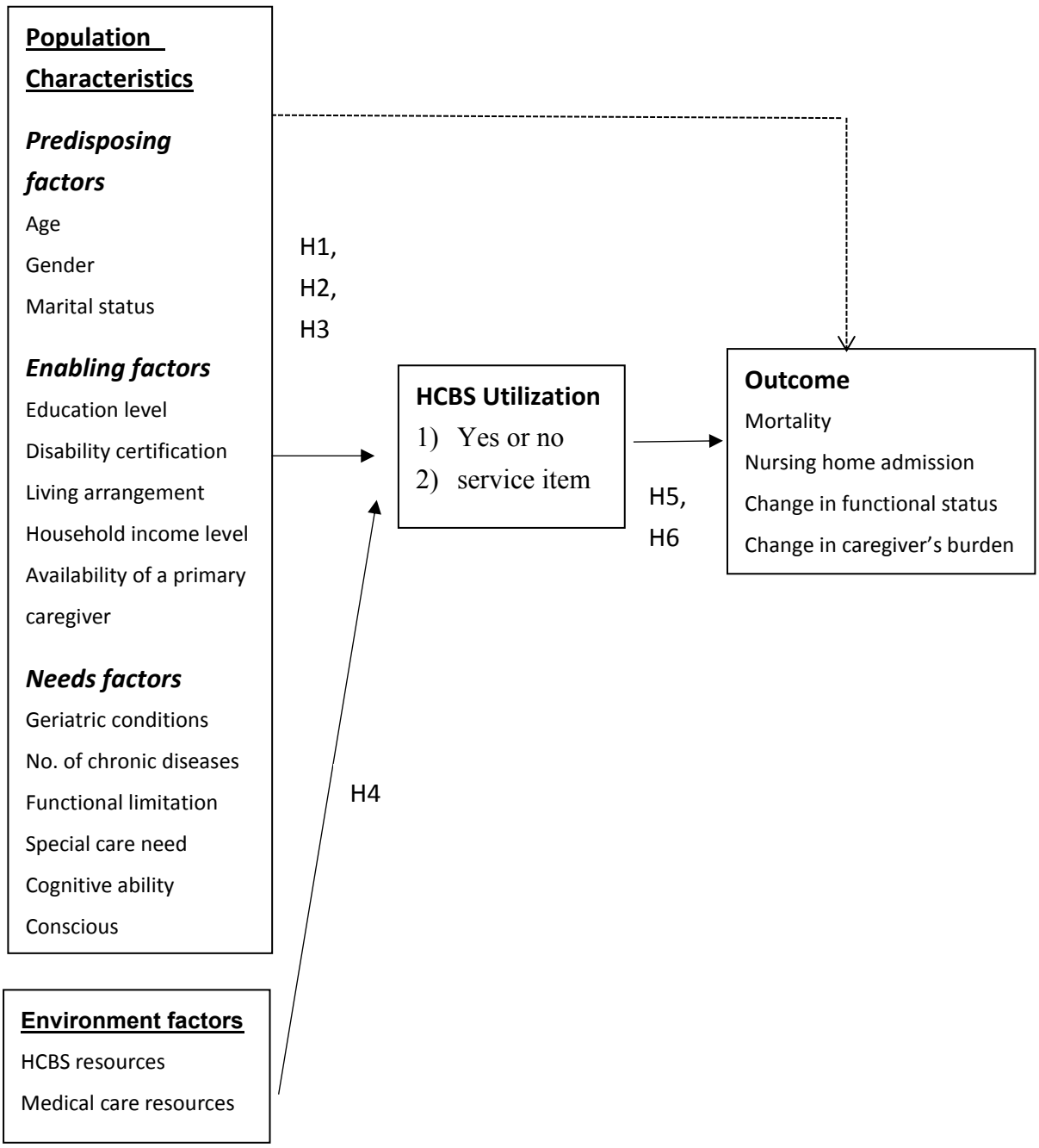

Figure 2 Model of Home- And Community-Based Services Utilization
(Revised from Andersen's behavior model, 1995).

3.2 Study Aims and Research Questions

In this study, I seek to describe different types of home- and community-based services (HCBS) utilization in the community dwelling dependent elderly and to explore the determinants and effects of home- and community-based services utilization. The specific aims and associated research questions of the proposed study are listed as follows:

Research question 1: What are the factors affecting home- and community-based services utilization by community dwelling dependent elderly?

Aim1: To understand the factors associated with home- and community-based services utilization by the community dwelling dependent elderly in Taiwan.

Hypothesis 1: Home- and community-based services utilization will be influenced by predisposing variables such as age, gender, and marital status.

Hypothesis 2: Home- and community-based services utilization will be influenced by enabling variables such as education level, social welfare identity, living arrangement, household monthly income and availability of a primary caregiver.

Hypothesis 3: Home- and community-based services utilization will be influenced by needs variables such as geriatric condition, number of chronic diseases, functional limitation, special care need, conscious, and cognitive ability.

Hypothesis 4: Home- and community-based services utilization will be influenced by

environmental factors such as HCBS resources and medical resources.

Research question 2: Does the home- and community-based service utilization affect user's health outcome?

Aim 2: To examine the effects of HCBS on the elderly who have received home- and community-based services.

Hypothesis 5: Community disable elderly who received home- and community-based services will have better health outcomes than elders with no services. The outcomes will be measured by mortality, nursing home admission, and change in care need level.

Research question 3: Does the home- and community-based service utilization affect caregiver's burden?

Aim 3: To examine the effect on caregiving burden of the elderly who have received home- and community-based long term care services.

Hypothesis 6: Caregiving burden will decrease if the disable elderly received home- and community-based services.

3.3 Data Sources and Study Population

This study uses a retrospective design based on individual-level data obtained from the database of the “Long Term Care Plan- Chiayi City”. Chiayi City is the first city to provide home- and community-based long term care services in Taiwan. The population as of December, 2015 was 270,366 and the proportion of older people (aged 65 years or over) was 12.74%. This proportion is similar to the average in Taiwan (12.51%).

The database contained users' basic demographic characteristics, education level, household income, health data, ability of daily living and self-care, cognitive function, home environment, family support and information on the utilization of home and community based long term care services. These data were obtained by the local government through an in home, face-to-face, multi-dimensions questionnaire interviews by trained care managers. The study population consists of community dwelling disable elderly age 65 or over who participated in “Ten Year Long Term Care Program” in Chiayi City between January 2013 and December 2015, and therefore healthy older people who did not receive long-term care services were not included in the study. Participants in the study were selected based on the following criteria: (a) aged 65 years or over; (b) newly enrolled in “Ten Year Long Term Care Plan”; (c) have stayed in the LTCP consecutively at least 3 or more months. Based on these criteria, there were 1,294 elders who have received evaluations and approvals for LTCP from

January 2013 to December 2015 in Chiayi City.

Since the purpose of the study was to identify the factors and effects associated with HCBS utilization, the analysis was divided into two parts. The first part was to explore the factors associated with home- and community-based services utilization. The dependent elderly who were newly enrolled in "Ten Year Long Term Care Program" in Chiayi City from January 2013 to December 2015 were included in the analysis of part 1 (n = 1,294). Part 2 was to explore the outcomes of HCBS receptors. In this part, participants were enrolled from January 2013 and continued for 18 months until June 2014, these participants were follow-up with an additional 27 months until September 2016. The final data set contained records for 680 participants.

3.4 Measurements

In the following sections, the variables at the individual level were obtained from the "Long Term Care Plan- Chiayi City", and those at the community level were from governmental sources. The analysis of this study was divided into two parts, and the measurements of dependent and independent variables were described as below:

Dependent Variable (part 1)

The dependent variable for aim1 was the use of home- and community-based services (HCBS). The study used a dichotomous measure that indicated whether the

elder had used (yes = 1) or had not used (no = 0) the home- and community-based services (HCBS) in the first month. In order to look into utilization pattern of different services, the current study also examined number of service using items.

More specifically, two types of LTC utilization patterns were used:

(1) Use of any HCBS in the first month: home-based services include homecare, in-home nursing visits, in-home rehabilitation, and in-home respite care. Community-based services include day care, respite care in nursing home, foster care, nutritious meals, and transportation services.

(2) The number of services using items (0 service, 1 service, 2 or more services) in the first month

In this study, home-based services include homecare, in-home nursing visits, in-home rehabilitation, and in-home respite care. Community-based services include day care, respite care in nursing home, foster care, nutritious meals, and transportation services.

Table 2 HCBC Utilization and Operational Definitions

	Dependent Variable	Operational Definition & Values
HCBC utilization	Use of any HCBS	Having used any services, for example, home-help, nursing visits, in-home rehabilitation, in-home

		respite care, day care, respite care in nursing home, foster care, nutritious meals, and transportation services: ***1 = yes, 0 = no***
	Items of HCBS use	***No use: 0*** ***One service: 1*** ***Two or more services: 2***

Independent Variables (part 1)

There were 16 independent variables in this study. These variables were selected based on the literature review, the conceptual framework proposed in the study, and the information available in the "LTCP-Chiayi" data. They were categorized into four components: 1) predisposing characteristics, 2) enabling factors, 3) receiver's needs for care, 4) environmental factors.

The predisposing factors include age, gender, and marital status. Age indicates the age when elders were enrolled in the study and was categorized into three groups which included 65-74, 75-84 and 85 or over. Gender is a dichotomous variable which was coded as 1 for male and 0 for female. Marital status is coded as married and not married (widowed, divorced, separated, and never married).

The enabling factors include education, disability certification, living arrangement, household income level, and availability of a primary caregiver. Education was measured by the categories illiterate, 1–6 years, junior high school, high school and above. Disability certification was categorized by four levels from “no certification” to “severe disability”. Household income level of elders served as the proxy measure for financial status. The income level was according to household monthly income which was categorized by two degrees from normal level to little lower/lower income level. Living arrangement was categorized into two groups: those who live alone and those who live with others. Primary caregiver was categorized into three categories: no primary caregiver, having primary caregiver and living together and having a primary caregiver but living separately.

The need factors include geriatric conditions, number of chronic diseases, functional disability, special care need, conscious and cognitive impairment. Geriatric conditions were measured by urinary incontinence and fecal incontinence. Number of chronic diseases refer to the ones being physician-diagnosed, and the chronic diseases include stroke, hypertension, heart disease, diabetes, digestion diseases, chronic obstructive pulmonary disease (COPD), chronic kidney disease, spinal cord injury, musculoskeletal system disease, urinary tract disease, cancer, dementia, Parkinson’s disease, cerebral paralysis, and immunological diseases. Functional limitation was

measured by the total number of ADL and of IADL limitations the elderly had. Six ADL limitations (getting around inside, eating, getting in/out of bed, dressing, bathing, and using toilet) and eight IADL limitations (meal preparation, money management, doing things around the house, laundering, shopping for grocery, getting around outside, helping with transportation, and giving medication) were included in the measure. Both the number of difficulties and the level of difficulties (some difficulty, a lot of difficulty, and unable on any ADL or IADL) were summed as two indicators for measuring the ADL and IADL difficulty. According to the measured items in difficulty of performing each activity of ADL and IADL, functional limitation was then categorized as IADL disability only and 1–2 items of ADL disability (mild disability), 3–4 items of ADL disability (moderate disability), and 5–6 items of ADL disability (severe disability). The special care refers to the need for any medical procedures (oxygen administration, vascular infusion, and catheter or fistula). The consciousness was categorized as conscious clear and conscious unclear. Cognitive functioning was assessed with the Short Portable Mental Status Questionnaire (SPMSQ). The questionnaire consists of ten questions: 1 point is given for each correct answer and 0 for each incorrect answer. Possible points range from 0 to 10, and higher points indicate higher cognitive functioning. According to the education level and the score of SPMSQ, the cognitive functioning was then categorized as 1) normal, 2) mild cognitive impairment, 3)

moderate cognitive impairment, and 4) severe cognitive impairment.

The environmental factors indicate the health care system affecting availability of home- and community-based services, and was assessed by the resources density of HCBS providers as well as medical services providers in community throughout the years. The distance to medical care was not included in this study, because Chiayi City is a small city and the driving time from downtown to suburb is less than 30 minimums. Thus, the distance does not seem to be a barrier, while the supply of workforce and facility may be factors that affect utilization. However, to set up long term care system, Taiwan government encourages private institutions and NGO to invest in long-term care services especially in home- and community-based care in these years. Therefore, the supply of providers probably affects the utilization of long term care services. Besides, Chiayi City is a small city with the richest medical resources in Taiwan, which may decrease HCBS utilization. In this study, the HCBS and medical resources were measured by medical care providers per 1,000 population per district and institutions providing HCBS per 1,000 population per district by year.

Dependent Variable (part 2)

The main outcome indicators for aim2 include mortality, nursing home admission, changing in functional status, and changing in caregiving burden. Mortality and nursing home admission were measured by survival status (death or alive) and living status (in

home or in LTC institution) in the last evaluation. The caregiving burden was assessed by the three major domains: physical, mental and family interaction. The question asked the caregivers to indicate how much stress they felt from caregiving using a 4-point scale ranging from 1 (not much stress at all) to 4 (a great deal of stress). Possible points range from 0 to 12, and higher points indicate the higher caregiving burden. The change in functional status and the change in caregiving burden were calculated by subtracting the baseline score from the score in the last evaluation. If a user's change in functional status was 0 or less than 0, the change in the functional status was defined as a sustained or improved. In the same manner, users whose change in functional status was 1 or more than 1 signified that their functional status have deteriorated. The same calculation was applied in caregiving burden. If the change in caregiving burden is less than zero, the change in caregiving burden is defined as improved. If the change in in caregiving burden was 0 or more than 0 signified that the caregiver's burden didn't improve.

Independent Variables (part 2)

This study examined two categories of independent variables, the use of home- and community-based services and the number of HCBS items used. For HCBS use, when there is any use of HCBS, the value is 1, whereas the value is 0 when there is no use of HCBS. For the number of HCBS items used, which refers to the total HCBS items used by the elderly in the study period, and was categorized into 1 item, 2 or more items.

Covariates

The covariates were the variables relevant to the use of home- and community-based long term care services. In the current study, it included age, gender, education level, marital status, disability certification, living arrangement, household income level, availability of a primary caregiver, geriatric conditions, number of chronic diseases, functional limitation, conscious, special care need, and cognitive impairment.

Data Analysis

Data was analyzed using the Stata 12. The level of significance for each statistical procedure is $p < 0.05$. Descriptive statistics were used to summarize characteristics of the study sample, which included mean, range, percentage, and standard deviation. To compare the characteristics by the utilization of HCBS, chi-square tests, t test and ANOVA were conducted for categorical and continuous variables respectively. The chi-square test was used for the dichotomous independent variables. The t test and the ANOVA F-test were used for the continuous and ordered independent variables to examine associations between predisposing, enabling, need, environmental variables and the utilization of LTC services.

In Part 1 of this study, to examine the determinants of HCBS utilization, logistic regression model was used to estimate the effect of predisposing, enabling, need and environmental on HCBS utilization.

In part 2 of this study, Cox proportional hazard model and multiple logistic

regression were employed to test the relationship between service utilization and the outcomes. The effect of HCBS utilization on mortality, nursing home admission were analyzed by Cox proportional hazard model. The change in functional status and the change in caregiving burden were analyzed by multiple logistic regression. The change in functional status and the change in caregiving burden were dependent variables. The independent variable was HCBS utilization, the predisposing factors, enabling factors, and need factors were input as control variables in this analysis.

Statistical Power

To ensure this sample size is met and could correctly reject the null hypothesis, a power analysis using the Gpower computer program was conducted and assume alpha=.05; two-tailed; medium effect size (f 2=.15), 16 predictors. The power for each of the regression analyses with this sample size is greater than 0.9.

Human Subjects

This study used data from LTCP- Chiayi City datasets in Taiwan. This dataset is non-publicly available and is provided to this study after deleting personal information to ensure that no participants could be identified. Therefore, the study did not constitute human subjects research.

Chapter 4 Results

This chapter provides detailed results from the statistical analyses that address the research questions and hypotheses. All hypotheses were tested at a significance level of p =.05. The discussion and implications of these findings are presented in Chapter Five. In this chapter, the characteristics of the sample are presented first, followed by the HCBS utilization. The multiple logistic regression and Cox proportional hazard model are used to answer the research questions with the adjustments of potential confounders.

4.1 Descriptive Analysis of the Sample

4.1.1 Sample Characteristics

Characteristics of the participates were summarized in Table 3. Of the 1,294 participates in LTCP, the ages range from 65 to 104 years. The mean age of the sample was 80.6 years (SD = 7.3); there were 280 (21.64%) young-old adults (ages 65-74), 632 (48.84%) middle-old adults (ages 75-84), and 382 (29.52%) old-old adults (85 and over). Over half of the participants were female (57.57%), half of them (53.25%) were married and over one third (46.75%) of them were single. Only 12% of the participants lived alone and 88% lived with someone that included spouses, relative and non-relatives.

Slightly over a quarter (28.75%) of the participants were illiterate, slightly over a third (38.79%) had less than six years education, and about one third (32.46%) had

completed up to junior high school education (Table 3). Eighty-six percent of the participants belonged to a normal income level. Ninety-one percent of the participants had a caregiver and 98% of study participants assessed to medical care less than 10 minutes. Approximately 38% of study participants had disability certifications.

In regards to care need, nearly 60% participants (59.20%) had urine or stool incontinence, Eighty-nine percent of study participants had least two chronic diseases with a mean of 3.22 chronic diseases (SD = 1.44). Approximately 24.03% of the participants belonged to “mild disability”, 23.57% belonged “moderate disability”, and 52.40% belonged “severe disability”. Furthermore, 17.39% of study participants needed special care such as nasogastric tube, tracheostomy tube, or respirator etc. Of the entire sample, 58.89% had cognitive impairment,

Table 3 Characteristics of Study Sample (N = 1,294)

Variable	n	%	Mean	SD
Predisposing factors				
Age (years)			80.55	7.27
65-74	280	21.64%		
75-84	632	48.84%		
≥85	382	29.52%		
Gender				
Female	745	57.57%		
Male	549	42.43%		
Marital Status				
Single	605	46.75%		
Married/cohabiting	689	53.25%		
Enabling factors				
Household Income Level				
Normal	1111	86.26%		
Little Lower/Lower	177	13.74%		
Disability certification				
no	807	62.36%		
minor	158	12.21%		
moderate	170	13.14%		
Severe/critical	159	12.29%		
Education				
illiterate	372	28.75%		
1–6 years or literate	502	38.79%		
Junior high school	141	10.90%		
High school and above	279	21.56%		
Living arrangement				
Living alone	156	12.06%		
With family/others	1138	87.94%		
Primary caregiver				
No caregiver	111	8.58%		
caregiver living together	1013	78.28%		
caregiver living separately	170	13.14%		
Need factors				
Geriatric conditions				
no condition	528	40.80%		

any one condition	215	16.62%		
both conditions	551	42.58%		
No. of chronic diseases			3.22	1.44
Functional limitation				
Mild	311	24.03%		
Moderate	305	23.57%		
Severe	678	52.40%		
Special care need				
Yes	225	17.39%		
No	1069	82.61%		
Cognitive ability				
normal	532	41.11%		
mild impairment	296	22.87%		
moderate impairment	248	19.17%		
severe impairment	218	16.85%		
Conscious				
clear	1111	85.86%		
unclear	183	14.14%		

4.1.2 HCBS Utilization

Of the 1,294 participants in LTCP, 820 (63.37%) of participants had received at least one type of home/community based services in the first month, and 474 (36.63%) did not receive any service. Table 4 shows the utilization by type of services used. Among 9 types of home/community services for elders with disability, the three most widely used services were homecare (57.92%), transportation (16.12%) and day care (11.11%). The least used services were the host family (0.37%). As for the amount of HCBS use, 83.53% of the HCBS users used only one service, 14.02 % used two services, and 2.45% used three or more services.

Table 4 HCBS Utilization by Services Item

N=820

	Service Type	N	%
Home-Based	Homecare	475	57.63%
	Home nursing	70	8.53%
	Home rehabilitation	69	8.21%
	Respire care (In-home)	68	8.29%
Community-base	Day care	91	11.09%
	Respire care (Institute)	39	4.75%
	Meal service	32	3.90%
	Transportation	131	15.97%
	Host family	3	0.36%
Number of items	1 item	685	83.54%
	2 items	115	14.02%
	3 or more items	20	2.44%

4.1.3 Characteristics of Study Participants by HCBS Utilization

The characteristics of the HCBS user and non-user groups are shown in Table 5. Significant differences were found in household income level, geriatric condition, and functional limitation. Compared to non-users, those who used HCBS were more likely to have lower income ($P<0.001$). Moreover, HCBS users were more likely to have higher limitation in functional ability ($p < 0.001$) and have urine or stool incontinence ($P<0.05$).

When the type of HCBS utilization was grouped based on and examined home-based services (homecare, in-home nursing care, in-home rehabilitation, and in-home respiratory) or community-based services (day care, home delivered meals,

transportation, respite care in the institute, and holster family), of the 1294 participates, 47.06% (n=1294) of elderly used at least one type of either home-based services and 22.18% (n=1294) of elderly used at least one type of community-based services.

Table 6 shows the utilization by the type of home-based service or community-based services. Considering the home-based services, individuals aged 75-84 years accounted for the greatest proportion (50.85%), and the mean age of the group was 80.83 years. Females accounted for the greatest proportion in home-based long term care services. Over half of the users (54.35%) were married and most of them (82.76%) belonged to the normal income level. 35.96% of home-based service users had disability certification, of which, 23.32% were moderate or severe disability certification. 37.11% of home-based users had 6 years or less of formal education, and 31.69% had least junior high school. Only 11.82% of home-based service users lived alone, and 88.18% lived with a spouse, adult children, extended family and friends. Most of them (92.28%) had a primary caregiver.

Regarding care needs, most home-based service users (65.35%) had at least one geriatric condition such as urine or fecal incontinence. The mean number of chronic diseases was 3.28 (SD=1.43). Individuals with severe functional limitation accounted for the greatest proportion (57.80%), while individuals with mild functional limitation represented the lowest proportion (14.45%); 20.36% of home based service users

needed special care because they had nasogastric (NG) tubes, foley tube, or tracheostomy tube etc.; and almost 60% of them (55.50%) had cognitive impairment according to SPMSQ. Compared to non-users, significant differences were found in household income level, geriatric condition, and functional limitation. Those who used home-based services were more likely to have lower income ($P<0.001$), higher c functional limitation ($p < 0.001$) and have urine or stool incontinence ($P<0.05$).

Considering the community-based group, 22.18% of elderly used at least one type of community-based services in this study. The mean ages were 80.30 years (SD=7.09). Individuals aged 75-84 years accounted for the greatest proportion (49.13%). Over half community service user were females (58.89%), single status (56.10%), and most of them (79.44%) belonged to the normal income level. About 24.04% of these users had moderate or severe disability certification and 42.16% had 6 years or less of formal education. 86.41% lived with a spouse or other relatives and most of them (87.11%) had a primary caregiver. The majority of community-based service users (59.93%) had at least one geriatric condition and mean number of chronic diseases was 3.21 (SD=1.34). About 46.01% of the elderly were in higher functional limitation; 17.77% needed special care and 58.54% had cognitive impairment according to SPMSQ.

Between users and non-users, there were significant differences in marital status ($p<0.001$), education ($p<0.01$), having a primary caregiver ($p<0.05$), and functional

limitation ($p<0.01$); those elders who used community-based services had significantly higher functional limitation ($p<0.001$), lower education level ($p=0.009$), being married ($p=0.000$), and had a primary caregiver ($p=0.003$).

When the use of HCBS was grouped and examined by number of service items used (0 item, 1 item, 2 or more items), of the 1294 participates, 685 (52.94%) of elderly used one home/ community-based service and 135 (10.43%) of elderly used two or more home/community-based services.

Table 7 shows the utilization by the number of service items. For those using only one service, individuals aged 75-84 years accounted for the greatest proportion (50.51%), and the mean age was 80.86 years. Over half of the users (56.93%) were females and half of them (52.41%) were married. Most of them (85.11%) belonged to the normal income level. 37.37% of the users had disability certification, of these, 10.66% were severe disability. 30.22% of the users had junior high school or above education. Only 10.66% of the users lived alone, and most of them (92.55%) had a primary caregiver.

Regarding care needs, over half of users (60.05%) had least one geriatric condition, of them, 42.04% were both urine and fecal incontinence. The mean number of chronic diseases was 3.24 (SD=1.42). Individuals with severe functional limitation accounted for the greatest proportion (51.97%), while individuals with mild functional

limitation represented the lowest proportion (20.58%); 16.35% of the users needed special care and almost 60% of them (58.54%) had cognitive impairment according to SPMSQ. Compared to non-users, significant differences were found in household income level and care need level. Those users were more likely to have lower income ($P<0.001$) and higher functional limitation ($p < 0.001$).

For those used two or more kinds of services group, individuals aged 75-84 years also accounted for the greatest proportion (48.15%), and the mean ages (79.91) were little younger than those use only one service or no use group. Over 60% of the users (62.96%) were females and half of them (51.85%) were single. Over one fourth (26.67%) belonged to the little low or low income level. 35.56% of the users had disability certification, of these, 12.59% had severe disability certification. Over one third (36.30%) of the users were illiteracy. Only 14.81% of the users lived alone, and most of them (86.67%) had a primary caregiver.

Regarding care needs, most of the users (75.56%) had at least one geriatric condition, of them, 62.22% were both urine and fecal incontinence. The mean number of chronic diseases was 3.38 (SD=1.37). Individuals with severe functional limitation accounted for the greatest proportion (68.89%), while individuals with mild functional limitation only accounted for 9.63%; About one third of the users (31.11%) needed special care and almost half of them (48.15%) had cognitive impairment according to

SPMSQ. Compared to non-users, significant differences were found in household income level, education level, geriatric condition, functional limitation, special care need and cognitive ability. Overall, those who used two or more services were more likely to be lower income ($P<0.001$), lower education level ($P<0.05$), had a geriatric condition ($P<0.001$), higher functional limitation ($p < 0.001$) and less cognitive impairment ($P<0.05$).

Table 5 Characteristics of Study Participants by HCBS Utilization (N = 1,294)

	Total N=1294		No services use N=474(36.63%)		Any service use N=820(63.37%)		P value
Variable	**n or mean**	**%**	**n or mean**	**%**	**n or mean**	**%**	
Predisposing factors							
Age (years)							
65-74	280	21.64%	111	23.42%	169	20.61%	0.388
75-84	632	48.84%	221	46.62%	411	50.12%	
≥85	382	29.52%	142	29.96%	240	29.27%	
Gender							
Female	745	57.57%	270	56.96%	475	57.93%	0.735
Male	549	42.43%	204	43.04%	345	42.07%	
Marital Status							
Single	605	46.75%	209	44.09%	396	48.29%	0.145
Married/cohabiting	689	53.25%	265	55.91%	424	51.71%	
Enabling factors							
Household Income							
Level							
Normal	1111	86.26%	432	91.72%	679	83.11%	0.000***
Little Lower/Lower	177	13.74%	39	8.28%	138	16.89%	
Disability certification							
no	807	62.36%	291	61.39%	516	62.93%	0.208
minor	158	12.21%	51	10.76%	107	13.05%	
moderate	170	13.14%	63	13.29%	107	13.05%	
Severe/critical	159	12.29%	69	14.56%	90	10.98%	
Education							
illiterate	372	28.75%	118	24.89%	254	30.98%	0.053
1–6 years or literate	502	38.79%	183	38.61%	319	38.90%	
Junior high school	141	10.90%	57	12.03%	84	10.24%	
High school and above	279	21.56%	116	24.47%	163	19.88%	
Living arrangement							
Living alone	156	12.06%	63	13.29%	93	11.34%	0.299
With family/others	1138	87.94%	411	86.71%	727	88.66%	
Primary caregiver							
No caregiver	111	8.58%	42	8.86%	69	8.41%	0.911
caregiver living together	1013	78.28%	368	77.64%	645	78.66%	

caregiver living separately	170	13.14%	64	13.50%	106	12.93%	
Need factors							
Geriatric conditions							
no condition	528	40.80%	222	46.84%	306	37.32%	0.003**
any one condition	215	16.62%	73	15.40%	142	17.32%	
both conditions	551	42.58%	179	37.76%	372	45.37%	
Mean no. of chronic diseases	3.22 (1.44)		3.14 (1.48)		3.26 (1.41)		0.125
Functional limitation							
Mild	311	24.03%	157	33.12%	154	18.78%	0.000***
Moderate	305	23.57%	88	18.57%	217	26.46%	
Severe	678	52.40%	229	48.31%	449	54.76%	
Special care need							
Yes	225	17.39%	71	14.98%	154	18.78%	0.082
No	1069	82.61%	403	85.02%	666	81.22%	
Cognitive ability							
normal	532	41.11%	178	37.55%	354	43.17%	0.218
mild impairment	296	22.87%	113	23.84%	183	22.32%	
moderate impairment	248	19.17%	94	19.83%	154	18.78%	
severe impairment	218	16.85%	89	18.78%	129	15.73%	
Conscious							
clear	1111	85.86%	401	84.60%	710	86.59%	0.323
unclear	183	14.14%	73	15.40%	110	13.41%	
Environmental factors							
HCBS provider							
<10.5/per 10000 elders	446	34.47%	162	34.18%	284	34.63%	0.327
10.5-11/per 10000 elders	461	35.63%	180	37.97%	281	34.27%	
>11/per 10000 elders	387	29.91%	132	27.85%	255	31.10%	
Medical provider							
<14/per 10000 persons	468	36.17%	167	35.23%	301	36.71%	0.720
14-15/per 10000 persons	209	16.15%	74	15.61%	135	16.46%	
>16/per 10000 persons	617	47.68%	233	49.16%	384	46.83%	

* p < 0.05 ** p < 0.01 ***p<0.001

Table 6 Utilization by the Type of Home-Based Service or Community-Based Service

Variable	Total N=1294		Home-base (%)	Community based(%)
Total			47.06%	22.18%
Predisposing factors				
Age (years)				
65-74	280	21.64%	20.20%	21.95%
75-84	632	48.84%	50.57%	49.13%
≥85	382	29.52%	29.23%	28.92%
Gender				
Female	745	57.57%	57.80%	58.89%
Male	549	42.43%	42.20%	41.11%
Marital Status				
Single	605	46.75%	45.65%	43.90% ***
Married/cohabiting	689	53.25%	54.35%	56.10%
Enabling factors				
Household Income Level				
Normal	1111	86.26%	82.76% ***	79.44% ***
Little Lower/Lower	177	13.74%	17.24%	20.56%
Disability certification				
no	807	62.36%	64.04%	62.02%
mild	158	12.21%	12.64%	13.94%
Moderate	170	13.14%	12.15%	13.59%
Severe/critical	159	12.29%	11.17%	10.45%
Education				
illiterate	372	28.75%	31.20%	31.36% **
1–6 years or literate	502	38.79%	37.11%	42.16%
Junior high school	141	10.90%	10.51%	12.20%
High school and above	279	21.56%	21.18%	14.29%
Living arrangement				
Living alone	156	12.06%	11.82%	13.59%
Not living alone	1138	87.94%	88.18%	86.41%
Primary caregiver				
No caregiver	111	8.58%	7.72%	12.89% **
caregiver living together	1013	78.28%	77.70%	71.23%
caregiver living separately	170	13.14%	14.58%	15.88%

Need factors				
Geriatric conditions				
no condition	528	40.80%	34.65% ***	40.07%
any one condition	215	16.62%	18.06%	14.98%
both conditions	551	42.58%	47.29%	44.95%
Mean no. of chronic diseases	3.22 (1.44)		3.28 (1.43)	3.26 (1.36)
Functional limitation				
Mild	311	24.03%	14.45% ***	26.48%
Moderate	305	23.57%	27.75%	22.30%
Severe	678	52.40%	57.80%	51.22%
Special care need				
Yes	225	17.39%	20.36%	17.77%
No	1069	82.61%	79.64%	82.23%
Cognitive impairment				
normal	532	41.11%	44.50%	41.46%
mild	296	22.87%	21.51%	23.69%
moderate	248	19.17%	18.88%	17.42%
severe	218	16.85%	15.11%	17.42%
Conscious				
clear	1111	85.86%	86.86%	82.93%
unclear	183	14.14%	13.14%	17.07%
Environmental factors				
HCBS provider				
<10.5/per 10000 elders	446	34.47%	34.48%	35.89%
10.5-11/per 10000 elders	461	35.63%	33.66%	35.89%
>11/per 10000 elders	387	29.91%	31.86%	28.22%
Medical provider				
<14/per 10000 persons	468	36.17%	36.29%	38.28%
14-15/per 10000 persons	209	16.15%	17.24%	15.33%
>16/per 10000 persons	617	47.68%	46.47%	47.39%

* p < 0.05 ** p < 0.01 *** p<0.001

Table 7 Utilization of HCBS by Service Item

	Total N=820		One service use N=685			Two or more service use N=135		
Variable	**n**	**%**	**n**	**%**		**n**	**%**	
Predisposing factors								
Age (years)								
65-74	169	20.61%	136	19.85 %		33	24.44%	
75-84	411	50.12%	346	50.51%		65	48.15%	
≥85	240	29.27%	203	29.64%		37	27.41%	
Gender								
Female	475	57.93%	390	56.93 %		85	62.96%	
Male	345	42.07%	295	43.07%		50	37.04%	
Marital Status								
Single	396	48.29%	326	47.59 %		70	51.85%	
Married	424	51.71%	359	52.41%		65	48.15%	
Enabling factors								
Income Level								
Normal	679	83.11%	583	85.11%	** *	99	73.33%	** *
Little Lower/Lower	138	16.89%	102	14.89%		36	26.67%	
Disability certification								
No	516	62.93%	429	62.63%		87	64.44%	
Minor	107	13.05%	88	12.85%		19	14.07%	
Moderate	107	13.05%	95	13.87%		12	8.89%	
Severe/critical	90	10.98%	73	10.66%		17	12.59%	
Education								
Illiterate	254	30.98%	205	29.93%		49	36.30%	**
1–6 years	319	38.90%	273	39.85%		46	34.07%	
Junior high school	84	10.24%	62	9.05%		22	16.30%	
High school and above	163	19.88%	145	21.17%		18	13.33%	
Living arrangement								
Living alone	93	11.34%	73	10.66%		20	14.81%	
Living with family/others	727	88.66%	612	89.34%		115	85.19%	
Primary caregiver								

No caregiver	69	8.41%	51	7.45%		18	13.33%	
Caregiver living together	645	78.66%	542	79.12%		103	76.30%	
Caregiver living separately	106	12.93%	92	13.43%		14	10.37%	
Need factors								
Geriatric conditions								
no condition	306	37.32%	273	39.85%		33	24.44%	** *
any condition	142	17.32%	124	18.10%		18	13.33%	
both conditions	372	45.37%	288	42.04%		84	62.22%	
Mean no. of diseases	3.26	(1.41)	3.20	(1.41)		3.43	(1.41)	
Functional limitation								
Mild	154	18.78%	141	20.58%	***	13	9.63%	***
Moderate	217	26.46%	188	27.45%		29	21.48%	
Severe	449	54.76%	356	51.97%		93	68.89%	
Special care need								
Yes	154	18.78%	112	16.35%		42	31.11%	***
No	666	81.22%	573	83.65%		93	68.89%	
Cognitive ability								
normal	354	43.17%	284	41.46%		70	51.85%	**
mild impairment	183	22.32%	162	23.65%		21	15.56%	
moderate impairment	154	18.78%	136	19.85%		18	13.33%	
severe impairment	129	15.73%	103	15.04%		26	19.26%	
Conscious								
clear	710	86.59%	602	87.88%		108	80.00%	
unclear	110	13.41%	83	12.12%		27	20.00%	
Environmental factors								
HCBS provider								
<10.5/per 10000 elders	284	34.63%	240	35.04%		44	32.59%	
10.5-11/per 10000 elders	281	34.27%	235	34.31%		46	34.07%	
>11/per 10000 elders	255	31.10%	210	30.66%		45	33.33%	
Medical provider								
<14/per 10000 persons	301	36.71%	256	37.37%		45	33.33%	
14-15/per 10000persons	135	16.46%	106	15.47%		29	21.48%	
>16/per 10000 persons	384	46.83%	323	47.15%		61	45.19%	

* $p < 0.05$ ** $p < 0.01$ *** $p<0.001$

4.2 Factors Associated with HCBS Use

To understand the factors associated with home- and community-based services utilization by the community dwelling dependent elderly, logistic regression analysis was used as the primary statistical technique to explore the association between predisposing factors, enabling factors, need factors, environmental factors and HCBS use.

Research question 1: What are the factors affecting home- and community-based services utilization by community dwelling dependent elderly?

Aim1: To understand the factors associated with home- and community-based services utilization by the community dwelling dependent elderly in Taiwan.

4.2.1 Association Between HCBS Use and Related Factors

Before the hypothesis was examined, the assumptions of multicollinearity were evaluated. Correlation analysis was conducted between the independent variables and found that the correlation between the independent variables ranged from r=0.002 to r=0.388 which did not exceed the guideline (r = 0.70). Moreover, I conducted collinearity statistics (Tolerance and Variance Inflation Factor), the variance inflation factor (VIF) ranged from 1.07-1.50. Therefore, there was no problem of multicollinearity.

Table 8 presents multivariate logistic regression results of the factors associated with HCBS utilization (with non-user group as the reference). Participates who belong to little lower/lower household income level (compared with normal income level, odds ratio [OR]= 2.067, p <0.001), having both geriatric conditions (OR = 1.407, p = 0.043, compared with no geriatric conditions) and more dependent in functional limitation (compared with mild disability, moderate disability, odds ratio [OR]= 2.413, p <0.001; severe disability, OR=1.833, p=0.001) were more likely to use HCBS. However, those having severe/critical disability certification (OR = 0.625, p = 0.013, compared with no disability certification), being severe cognitive impairment (OR= 0.643, p = 0.015, compared with normal cognitive function) and unclear conscious (OR= 0.618, p = 0.011, compared with conscious clear) were less likely to use HCBS.

Model fit was measured with the Hosmer and Lemeshow goodness-of-fit test. Good model fit is specified by a nonsignificant and small chi squared value. The present analysis indicated the chi-square probability of 0.252 for significance in this study.

Table 8 Multiple Logistic Regressions of HCBS Use and Related Factors

Factors	OR	95% C.I.	P
Predisposing factors			
Age (years)			
65-74	1		
75-84	1.197	.876-1.636	0.258
≥85	1.105	.776-1.574	0.580
Gender			
Female	1		
Male	1.070	.812-1.409	0.631
Marital Status			
Single	1		
Married/cohabiting	.785	.597-1.033	0.084
Enabling factors			
Household Income Level			
Normal	1		
Little Lower/Lower	2.067	1.388-3.078	<0.001***
Disability certification			
No	1		
Mild	1.177	.806- 1.721	0.399
Moderate	.861	.596- 1.242	0.422
Severe/critical	.625	.431- .906	0.013*
Education			
Illiterate	1		
1–6 years or literate	.818	.597- 1.119	0.208
Junior high school	.652	.421- 1.010	0.056
High school and above	.730	.498- 1.068	0.105
Living arrangement			
Living alone	1		
Not living alone	1.288	.848- 1.955	0.236
Primary caregiver			
No caregiver	1		
Having caregiver	1.004	.637- 1.581	0.986
Need factors			
Geriatric conditions			
No condition	1		
Any one condition	1.223	.859- 1.743	0.264

Both conditions	1.407	1.011- 1.957	0.043*
Mean no. of chronic diseases	1.039	0.955- 1.132	0.371
Functional limitation			
Mild	1		
Moderate	2.413	1.700- 3.425	<0.001***
Severe	1.833	1.302- 2.581	0.001***
Special care need			
No	1		
Yes	1.194	.840- 1.698	0.324
Cognitive impairment			
Normal	1		
Mild	.773	.565-1.058	0.108
Moderate	.765	.547-1.071	0.119
Severe	.643	.451- .917	0.014**
Conscious			
Clear	1		
Unclear	.618	.426- .897	0.011**
Environmental factors			
HCBS provider			
<10.5/per 10000 elders	1		
10.5-11/per 10000 elders	.891	.672- 1.181	0.421
>11/per 10000 elders	1.184	.788- 1.780	0.416
Medical provider			
<14/per 10000 persons	1		
14-15/per 10000 persons	.695	.412- 1.171	0.172
>16/per 10000 persons	.914	.688- 1.215	0.538

* p < 0.05 ** p < 0.01 ***p<0.001

Model fit:

Pearson chi2(1253) = 1286.07

Prob > chi2 = 0.2520

Table 9 shows multivariate logistic regression results of the factors associated with home-based services utilization (with non-user group as the reference) and community-based services (with non-user group as the reference) utilization. The findings indicate the relative probability of using home-based service in comparison with not using home-based service. Compared to the non-user group, elders belonging to little lower or lower income household were more likely to use home-based services . With regard to need factors, moderate functional limitation, severe functional limitation and suffering two geriatric conditions increase the odds of using home-based services (OR 3.021, 95% CI 2.128–4.289, OR 2.624, 95% CI 1.851–3.719 and OR 1.403, 95% CI 1.023–1.925). However, having severe disability certification (OR 0.651, 95% CI 0.450–0.941), suffering severe cognitive impairment (OR 0.662, 95% CI 0.467–0.938), and conscious unclear (OR 0.585, 95% CI 0.407–0.841) decrease the likelihood of using home-based services.

Household income level was positively associated with community-based services utilization. Compared to the non-user group, little lower and low income elderly were more likely to use community-based care (OR 1.679, 95% CI 1.155–2.442). The results point to the same direction. Low social economic status was associated with use of services. The results are not contrary to each other. Elders who were getting high school and above education (OR 0.605, 95% CI 0.380–0.964), married (OR 0.605, 95% CI

0.380–0.964), and having primary caregiver (OR 0.552, 95% CI 0.341–0.893) showed significant associations with a decreasing likelihood of using community-based services.

Table 9 Multivariate Analysis of Factors Associated with Use of Home-Based and Community-Based Care

Factors	Home-based (Ref. not using)	Community-based (Ref. not using)
	OR (95% CI)	**OR (95% CI)**
Predisposing factors		
Age (years)		
65-74	1	1
75-84	1.249(0.919-1.695)	0.929(0.649-1.329)
≥85	1.191(0.841-1.687)	0.859(0.569-1.297)
Gender		
Female	1	1
Male	0.933(0.715-1.219)	1.156(0.844-1.584)
Marital Status		
Single	1	1
Married	1.125(0.863-1.466)	0.606(0.444-0.826) **
Enabling factors		
Household Income Level		
Normal	1	1
Little Lower/Lower	1.793(1.260-2.553) ***	1.679(1.155-2.442) **
Disability certification		
No	1	1
Mild	0.955(0.666-1.368)	1.275(0.848-1.918)
Moderate	0.703(0.491-1.008)	1.075(0.710-1.627)
Severe/critical	0.651(0.450-0.941) *	0.779(0.495-1.225)
Education		
Illiterate	1	1
1–6 years or literate	0.789(0.585-1.066)	1.039(0.738-1.463)
Junior high school	0.741(0.483-1.138)	1.138(0.698-1.856)
High school and above	0.930(0.642-1.349)	0.605(0.380-0.964) *
Living arrangement		
Living alone	1	1
Not living alone	0.775(0.512-1.173)	1.431(0.883-2.320)
Primary caregiver		
No caregiver	1	1
Having caregiver	1.263(0.807-1.977)	0.552(0.341-0.893) *

Need factors			
Geriatric conditions			
No condition	1		1
Any one condition	1.381(0.980-1.947)		0.885(0.585-1.338)
Both conditions	1.403(1.023-1.925)	*	1.159(0.796-1.687)
No. of chronic diseases	1.034(0.953-1.123)		1.042(0.946-1.147)
Functional limitation			
Mild	1		1
Moderate	3.021(2.128-4.289)	***	0.814(0.546-1.213)
Severe	2.624(1.851-3.719)	***	0.738(0.496-1.098)
Special care need			
No	1		1
Yes	1.32(0.951-1.844)		0.959(0.647-1.421)
Cognitive impairment			
Normal	1		1
Mild	0.750(0.553-1.017)		1.011(0.708-1.442)
Moderate	0.821(0.592-1.137)		0.885(0.598-1.308)
Severe	0.662(0.467-0.938)	*	0.976(0.652-1.460)
Conscious			
Clear	1		1
Unclear	0.585(0.407-0.841)	**	1.418(0.937- 2.145)
Environmental factors			
HCBS provider			
<10.5/per 10000 elders	1		1
10.5-11/per 10000 elders	0.925(0.702-1.218)		0.954(0.692-1.315)
>11/per 10000 elders	1.138(0.769-1.684)		0.863(0.541-1.377)
Medical provider			
<14/per 10000 persons	1		1
14-15/per 10000 persons	0.836(0.506-1.380)		1.037(0.570-1.886)
>16/per 10000 persons	0.946(0.717-1.249)		1.061(0.768-1.466)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Ordered logistic regression models, appropriate for analyzing categorical ordered variables, were used for analyzing number of HCBS items used (none, one, two or more). In this study, some variables (i.e., living arrangement, geriatric conditions) violated the proportional odds assumption, therefore, I used partial proportional odds models in STATA. Table 10 showed the factors associated with HCBS utilization measured by the service item. Household income level, consciousness, disability certification, functional limitation, cognitive impairment and geriatric conditions were significantly associated with HCBS utilization. When all of the other variables in the model are held constant, elders with lower household income level (OR 2.241, 95% CI 1.596-3.147), having moderate or severe functional limitation (OR 2.390, 95% CI 1.711-3.338; OR 1.786, 95% CI 1.274-2.504) were about two times more likely to use more service items. Elders having both urine and fecal incontinence (OR 2.264, 95% CI 1.432-3.579) had 2.3 times greater odds of using more HCBS items, while elders with unclear consciousness (OR 0.699, 95% CI 0.495-0.988), cognitive impairment (OR 0.710, 95% CI 0.533-0.946), having severe disability certification (OR 0.626, 95% CI 0.440-0.891) tended to use less HCBS items.

Table 10 Ordered Logistic Regression Analysis Between Independent Variables and HCBS Utilization (0 = No use, 1 = One item, 2 = Two or More items) (n = 1,294)

Factors	HCBS utilization (2 or more, 1 item vs non-use)	HCBS utilization (2 or more vs 1 item , non-use)
	OR (95% CI)	OR (95% CI)
Predisposing factors		
Age (years)		
65-74	1	1
75-84	1.091(0.816-1.458)	1.091(0.816-1.458)
≥85	1.022(0.734-1.421)	1.022(0.734-1.421)
Gender		
Female	1	1
Male	1.006(0.781-1.296)	1.006(0.781-1.296)
Marital Status		
Single	1	1
Married	0.807(0.627-1.038)	0.807(0.627-1.038)
Enabling factors		
Income Level		
Normal	1	1
Lower	2.241(1.596-3.147)***	2.241(1.596-3.147)***
Disability certification		
No	1	1
Mild	1.165(0.828-1.638)	1.165(0.828-1.638)
Moderate	0.757(0.543-1.055)	0.757(0.543-1.055)
Severe/critical	0.626(0.440-0.891)**	0.626(0.440-0.891)**
Education		
Illiterate	1	1
1–6 years or literate	0.803(0.604-1.068)	0.803(0.604-1.068)
Junior high school	0.640(0.416-0.982)*	1.435(0.832-2.475)
High school and above	0.717(0.504-1.020)	0.717(0.504-1.020)
Living arrangement		
Living alone	1	1
Not living alone	1.288(0.862-1.925)	0.627(0.353-1.115)
Primary caregiver		
No caregiver	1	1

Having caregiver	0.879 (0.576-1.341)	0.879 (0.576-1.341)
Need factors		
Geriatric conditions		
No condition	1	1
Any one condition	1.239(0.890-1.725)	1.239(0.890-1.725)
Both conditions	1.331(0.962-1.842)	2.264(1.432-3.579)***
No. of chronic diseases	1.050(0.972-1.136)	1.050(0.972-1.136)
Functional limitation		
Mild	1	1
Moderate	2.390(1.711-3.338)***	2.390(1.711-3.338)***
Severe	1.786(1.274-2.504)***	1.786(1.274-2.504)***
Special care need		
No	1	1
Yes	1.343(0.977-1.847)	1.343(0.977-1.847)
Cognitive impairment		
Normal	1	1
Mild	0.710(0.533-0.946)*	0.710(0.533-0.946)*
Moderate	0.714(0.525-0.971)*	0.714(0.525-0.971)*
Severe	0.688(0.494-0.957)*	0.688(0.494-0.957)*
Conscious		
Clear	1	1
Unclear	0.699(0.495-0.988)*	0.699(0.495-0.988)*
Environmental factors		
HCBS provider		
<10.5/per 10000	1	1
10.5-11/per 10000	0.937(0.722-1.215)	0.937(0.722-1.215)
>11/per 10000	1.104(0.764-1.596)	1.104(0.764-1.596)
Medical provider		
<14/per 10000	1	1
14-15/per 10000	0.889(0.553-1.432)	0.889(0.553-1.432)
>16/per 10000	1.006(0.774-1.308)	1.006(0.774-1.308)

* p < 0.05 ** p < 0.01 *** p < 0.001

To understand the factors associated with individual categories of HCBS, I analyzed the categories with utilization rate more than 10% for the further analysis which include homecare, transportation, respire service (in-home and institution) and day care. Given that participants could use multiple services across categories, I evaluated the odds of HCBS use within each category (e.g., using homecare vs not using homecare services) for the full sample. Table 11 shows the results of the factors associated with individual categories of HCBS utilization (with non-user group as the reference). Household income level, living status, consciousness, disability certification, functional limitation, having primary caregiver and LTC resources were significantly associated with use of homecare service. A greater likelihood of homecare service use was associated with lower income, living alone, no disability certification, having a caregiver, and having moderate or severe functional limitation. When controlling for other factors, those with lower household income level and those having primary caregivers were about two times more likely to use homecare service (OR 1.924, 95% CI 1.353–2.736, OR 1.755, 95% CI 1.070–2.877). Moreover, elders with moderate or severe functional limitation have more than twice as likely as mild functional limitation to use homecare service (OR 2.998, 95% CI 2.092–4.297, OR 2.037, 95% CI 1.417–2.926). In addition, those with unclear conscious were 54% less likely to use homecare service (OR 0.463, 95% CI 0.309–0.694) and those living with family or others were

nearly 40% less likely to use homecare service (OR 0.597, 95% CI 0.390–0.912).

Transportation service use was significantly associated with level of functional limitation and education. Those with severe and moderate functional limitation were greater many times over than those with mild functional limitation to utilize transportation services (OR 51.664, 95% CI 6.999–381.376, OR 15.767, 95% CI 2.062–120.557).

A greater likelihood of respire service use was associated with lower income and having both urine and fecal incontinence. When controlling for other variables, those with lower household income level had 1.9 times greater odds than normal household income level of using respire services (OR 1.919, 95% CI 1.131–3.255), and those having both urine and fecal incontinence had 1.8 times greater odds of this service utilization (OR 1.769, 95% CI 1.020–3.070). Elders with mild cognitive impairment were 62% less likely to use respire services than elders with normal cognitive ability (OR 0.381, 95% CI 0.196–0.742).

Married elders, those who belonged lower household income, having severe functional limitation and not living alone were significantly associated with use of day care category. Controlling for other variables, those married elders were 67% less likely to use day care service and those belonged lower household income level were 66% less likely to use day care service. In addition, elders were much less likely to use day care

if they had moderate or severe functional limitation. However, those living with families or others were six times more likely to use day care service than those living alone.

Table 11 Multivariate Analysis of Factors Associated with Use of Home-Based and Community-Based Care

Factors	Homecare	Transportation	Respire care	Day care
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Predisposing factors				
Age (years)				
65-74	1	1	1	1
75-84	1.095(0.797-1.504)	0.816(0.491-1.359)	0.834(0.489-1.421)	1.235(0.613-2.487)
≥85	1.184(0.825-1.698)	1.027(0.577-1.827)	0.836(0.451-1.547)	1.070(0.495-2.310)
Gender				
Female	1	1	1	1
Male	0.864(0.654-1.140)	1.189(0.758-1.863)	0.902(0.555-1.464)	0.984(0.559-1.730)
Marital Status				
Single	1	1	1	1
Married	1.293(0.982-1.704)	1.118(0.717-1.742)	0.760(0.477-1.212)	0.329(0.191-0.569)***
Enabling factors				
Income Level				
Normal	1	1	1	1
Lower	1.924(1.353-2.736)***	0.871(0.476-1.595)	1.919(1.131-3.255)*	0.335(0.123-0.913)*
Disability certification				
No	1	1	1	1
Mild	0.960(0.664-1.389)	1.654(0.953-1.871)	0.928(0.479-1.800)	1.727(0.944-3.158)
Moderate	0.619(0.422-0.909)*	1.314(0.748-2.307)	1.090(0.596-1.992)	1.611(0.659-3.938)
Severe/critical	0.659(0.444-0.979)*	0.608(0.328-1.225)	1.018(0.545-1.900)	0.840(0.366-1.930)
Education				
Illiterate	1	1	1	1
1–6 years or literate	0.769(0.563-1.049)	0.696(0.423-1.146)	0.912(0.545-1.525)	1.390(0.670-2.884)
Junior high school	0.733(0.469-1.146)	1.015(0.524-1.966)	0.596(0.257-1.380)	1.554(0.527-4.585)
High school and above	0.838(0.570-1.231)	0.516(0.269-0.989)*	0.920(0.474-1.783)	0.637(0.215-1.883)
Living arrangement				
Living alone	1	1	1	1
Not living alone	0.597(0.390-0.912)*	2.391(0.806-7.097)	1.750(0.704-4.352)	6.682(2.230-17.696)**
Primary caregiver				
No caregiver	1	1	1	1
Having caregiver	1.755(1.070-2.877)*	0.784(0.376-1.633)	4.193(0.967-18.180)	1.575(0.437-5.679)
Need factor				

Geriatric conditions				
Any one condition	1.420(1.000-2.016)	0.551(0.266-1.142)	1.021(0.525-1.988)	1.509(0.822-2.771)
Both conditions	1.317(1.023-1.824)	0.940(0.561-1.576)	1.769(1.020-3.070)*	1.453(0.741-2.851)
No. of chronic diseases	1.050(0.964-1.143)	1.028(0.897-1.179)	1.061(0.917-1.227)	1.133(0.956-1.343)
Functional limitation				
Mild	1	1		
Moderate	2.998(2.092-4.297)***	15.767(2.062-120.557)**	1.821(0.913-3.629)	0.367(0.211-0.641) ***
Severe	2.037(1.417-2.926)***	51.664(6.999-381.376)***	1.690(0.851-3.353)	0.051(0.022-0.118) ***
Special care need				
No	1	1	1	1
Yes	0.731(0.514-1.040)	1.240(0.778-1.975)	0.694(0.384-1.255)	0.246(0.056-1.073)
Cognitive impairment				
Normal	1	1	1	1
Mild	0.863(0.629-1.184)	1.371(0.849-2.211)	0.381(0.196-0.742)**	0.814(0.419-1.580)
Moderate	0.914(0.654-1.277)	0.672(0.368-1.229)	0.763(0.436-1.338)	0.957(0.506-1.810)**
Severe	0.745(0.517-1.073)	0.733(0.407-1.321)	0.969(0.552-1.700)	1.084(0.547-1.073)
Conscious				
Clear	1	1	1	1
Unclear	0.463(0.309-0.694)***	1.217(0.742- 1.996)	0.682(0.354- 1.312)	1.497(0.576- 3.889)
Environmental factors				
HCBS provider				
<10.5/per 10000	1	1	1	1
10.5-11/per 10000	0.744(0.558-0.993)*	1.197(0.759-1.886)	0.989(0.583-1.679)	0.549(0.267-1.128)
>11/per 10000	1.172(0.786-1.748)	0.887(0.446-1.761)	1.447(0.712-2.983)	0.657(0.240-1.797)
Medical provider				
<14/per 10000	1	1	1	1
14-15/per 10000	0.770(0.460-1.289)	1.302(0.550-3.085)	1.136(0.487-2.649)	0.644(0.361-1.151)
>16/per 10000	1.023(0.765-1.367)	1.064(0.672-1.683)	0.972(0.571-1.654)	0.655(0.295-1.455)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

4.3 Outcome Associated with HCBS Use

In this study, the number of elders newly certified as being eligible for LTCP from January 2013 to June 2014 was 680. The data for this cohort were collected until September 2016. The main outcome of the elders included mortality, nursing home admission, changes in functional limitation, and changes in caregiver's burden. Aim2 and aim3 explore if HCBS utilization was associated with mortality, nursing home admission, changes in functional limitation, and changes in caregiving burden while controlling other variables included in the study.

Research question 2: Does the home- and community-based service utilization affect user's health outcome, including mortality, nursing home admission and changing in functional limitation?

Aim 2: To examine the effect on the elderly who have accepted home and community-based services.

Research question 3: Does the home- and community-based service utilization affect caregiver's burden?

Aim 3: To examine the effect on caregiver's burden of home- and community-based long-term care services.

4.3.1 Characteristics of Follow-up Cohort and HCBS Utilization

The initial study cohort was 680 elders. Of these, 52 elders stayed in LTCP less than 3 months due to institutionalization, death or moving to other county, and hence were excluded from the analysis. The analytical sample included 628 subjects who entered the program at various times during the 45-month interval. The average follow-up period was 27.24 ± 0.48 months. During the follow-up period, 217 (34.55%) of the sample were died; 411 (65.45%) were still alive, of these, 78 (18.98%) admitted to nursing home.

Of the 628 analytical sample, there were 342 (54.46%) elders who received home/community based long-term care services more than 3 months, and the other 286 (45.54%) elders who did not receive the HCBS services or received services less than 3 months were considered as non-user group. Table 12 summarizes the baseline characteristics of the study cohort by utilization strata. The mean age of the sample was 80.32 years old. Almost 60% of them were female (59.39%) and half of them (51.10%) were married. 84.71% of the sample belonged to a normal income level and 36.94% of them had disability certifications. Almost 30% (29.30%) of the sample were illiterate and slightly over a third (38.06%) had less than six years education. As to the living situation, 13.06% of the samples were living alone, and over 90% of the sample (91.88%) had a caregiver.

In regards to care need, 56.69% of study participants experienced urine or stool incontinence. The mean number of chronic diseases was 3.11 (SD = 1.42). Approximately 46.66% of the participants belonged to “little to moderate functional limitation”, 53.34% belonged to “severe functional limitation”. Further, 84.24% of study participants were conscious clear, 15.61% needed special care and 68.79% had cognitive impairment.

In the user group, individuals aged 75-84 years accounted for the greatest proportion (51.10%), and the mean age was 80.64 years. Over half of users were females (58.36%), married status (51.42%), and most of them (79.50%) belonged to the normal income level. About 34.07% of these users had disability certification and 68.77% had 6 years or less of formal education. 87.70% lived with spouse or other relatives and most of them (89.91%) had a primary caregiver. The mean number of chronic diseases was 3.06 (SD=1.30). About 56.47% of elderly were severe functional limitation; 17.35% needed special care and 55.56% had cognitive impairment according to SPMSQ.

Comparing user and non-user groups, there were significant differences in household income level ($p<0.001$) and geriatric conditions ($p<0.05$); those who used home/community based services had significantly lower household income level and experienced more urine or stool incontinence.

Table 12 Baseline Characteristics of the Study Cohort (N = 628)

	Total N=628		User Group N=342(54.46%)		Non-user Group N=286(46.54%)		P value[a]
Variable	n or mean	%	n or mean	%	n or mean	%	
Predisposing factors							
Age (years)							
65-74	141	23.49%	71	20.76%	70	24.48%	0.539
75-84	311	49.82%	173	50.58%	138	48.25%	
≥85	176	26.69%	98	28.65%	78	27.27%	
Mean(SD)	80.32 (6.98)		80.68 (6.80)		79.89 (7.17)		0.161
Gender							
Female	373	59.39%	200	58.48%	173	60.49%	0.609
Male	255	40.61%	142	41.52%	113	39.51%	
Marital Status							
Single	307	48.89%	166	48.54%	141	49.30%	0.849
Married	321	51.11%	176	51.46%	145	50.70%	
Enabling factors							
Household Income Level							
Lower/ Little Lower	96	15.29%	70	20.47%	26	9.09%	0.000**
Normal	532	84.71%	272	79.53%	260	90.91%	
Disability certification							
no	396	63.06%	225	65.79%	171	59.79%	0.121
yes	232	36.94%	117	34.21%	115	40.21%	
Education							
illiterate	184	29.30%	113	33.04%	71	24.83%	0.079
1–6 years or literate	239	38.06%	123	35.96%	116	40.56%	
Junior high school above	205	32.64%	106	30.99%	99	34.62%	
Living arrangement							
Living alone	82	13.06%	40	11.70%	42	14.69%	0.268
With family/others	546	86.94%	302	88.30%	244	85.31%	
Primary caregiver							
No caregiver	51	8.12%	32	10.09%	19	6.11%	0.068

Having a caregiver		577	91.88%	285	89.91%	292	93.89%	
Need factors								
Geriatric conditions								
no condition		272	43.31%	119	37.54%	153	49.20%	0.003*
any one condition		356	56.69%	198	62.46%	158	50.80%	
Mean no. of chronic diseases		3.11 (1.42)		3.06 (1.30)		3.16 (1.53)		0.374
Functional limitation								
Lower to moderate		293	46.66%	155	45.32%	138	48.25%	0.464
Severe		355	53.34%	187	54.68%	148	51.75%	
Special care need								
Yes		98	15.61%	54	15.79%	44	15.38%	0.889
No		530	84.39%	288	84.21%	242	84.62%	
Cognitive ability								
normal		196	31.21%	107	31.29%	89	31.12%	0.964
impairment		432	68.79%	235	68.71%	197	68.88%	
Conscious								
clear		529	84.24%	286	83.63%	243	84.97%	0.646
unclear		99	15.76%	56	16.37%	43	15.03%	
Outcome								
Censor	No event before 30 Sep.2016	331						
	Move out	4						
Event	Death	217		101		116		
	Institutionalization	78		43		35		

4.3.2 HCBS Use and Mortality

During the study period, 101 (29.53%) of 342 seniors in the user group died, as compared with 116 (40.56%) of 286 seniors in the non-user group (p =0.004). The Kaplan-Meier survival curves for HCBS users and non-users are illustrated in Figure 3. The log-rank test showed the difference in survival rates between the two groups is significant (p =0.018).

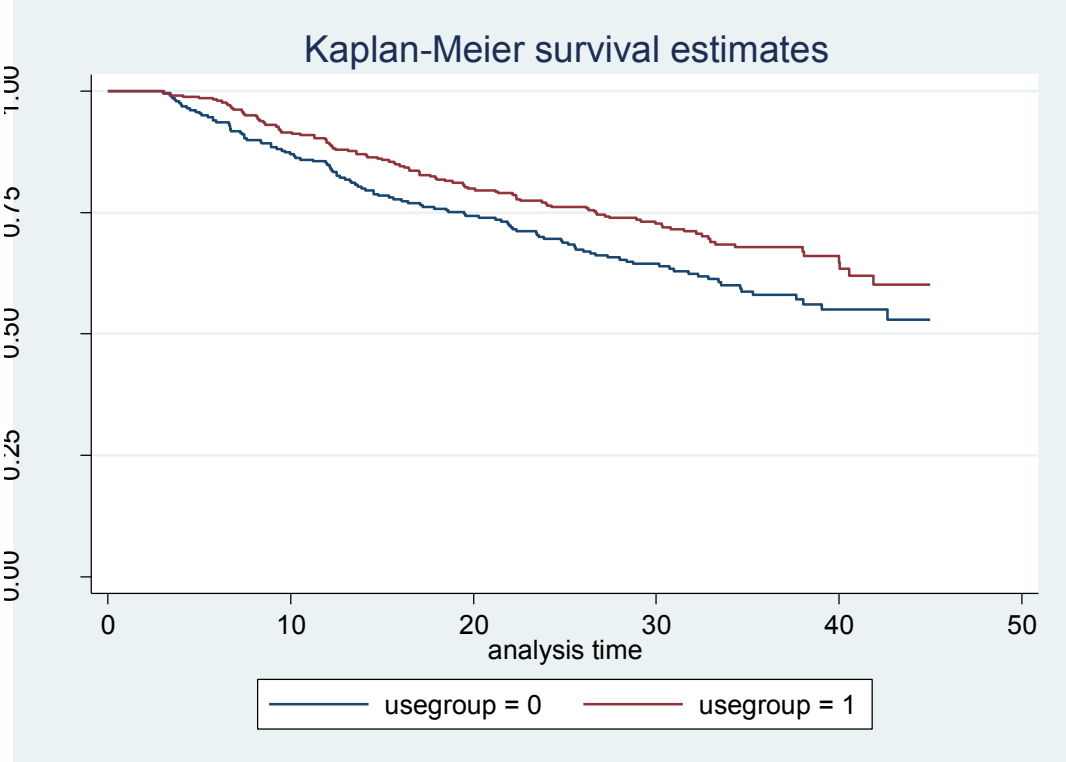

Figure 3 Plot of Kaplan-Meier Survival Curves for HCBS Users and Non-users

In order to further examine the influence of HCBS utilization on elder's mortality and nursing home admission, the Cox proportionate hazard model was used to determine whether the use of home/community long-term care service was associated with the

mortality and nursing home admission.

Table 13 shows multivariate cox regression results of the association between HCBS utilization and mortality (with non-user group as the reference). Compared to the non-user groups, user group had a 33 % lower hazard (risk) of death than non-user group (unadjusted hazard ratio [HR] 0.666 [95% CI 0.510–0.870], p=0.003). When covariates, including sex, age, marital status, education, household income level, living status, conscious, number of chronic diseases, functional limitation, disability certification, and cognitive function were controlled in the model, the adjusted HR was 0.589 (95% CI, 0.447–0.776), p<0.001.

In order to assess if utilizing more items of HCBS had positive effect on elder's mortality, the utilization of HCBS was categorized by number of service items used (0= no use; 1= only one service use; 2= two or more services use). When covariates were controlled in the model, the elders who used two or more services represented a 37 % lower hazard (risk) of death than the non-user group (adjusted hazard ratio [HR] 0.63 [95% CI 0.43–0.94, p=0.022). (see Table 14)

Table 13 Cox Regression of the Association Between HCBS Utilization and Mortality (n = 628)

Factors	Haz. Ratio (95% CI)
HCBS utilization	
no	1
yes	0.589(0.447-0.776)***
Age (years)	
65-74	1
75-84	0.975(0.676-1.406)
≥85	1.434(0.955-2.154)
Gender	
Female	1
Male	1.705(1.239-2.347)**
Marital Status	
Single	1
Married	0.803(1.239-2.347)
Household Income Level	
Normal	1
Lower	1.163(0.777-1.739)
Disability certification	
no	1
yes	0.977(0.732-1.303)
Education	
illiterate	1
1–6 years	1.362(0.946-1.962)
Junior high school and above	1.097(0.721-1.670)
Living arrangement	
Living alone	1
Not living alone	1.192(0.711-1.997)
Primary caregiver	
No caregiver	1
Having a caregiver	0.955(0.577-1.579)
Geriatric conditions	
no condition	1
any one condition	1.277(0.904-1.802)
Mean no. of chronic diseases	1.061(0.969-1.162)
Functional limitation	1.552(1.090-2.209)*

Special care need	
no	1
yes	1.491(1.049-2.119)*
Cognitive impairment	
normal	1
impairment	0.891(0.648-1.225)
Conscious	
clear	1
unclear	1.450(1.024-2.055)*

* p < 0.05 ** p < 0.01 *** p < 0.001

Table 14 Cox Regression of the Association Between HCBS Using Items and Mortality (n = 628)

Factors	Haz. Ratio (95% CI)
HCBS utilization	
No service	1
1 service	1.206(0.871-1.671)
2 or more services	0.632(0.427-0.937)*
Age (years)	
65-74	1
75-84	1.040(0.720-1.504)
≥85	1.509(1.002-2.274)*
Gender	
Female	1
Male	1.684(1.219-2.327)**
Marital Status	
Single	1
Married	0.814(0.591-1.121)
Household Income Level	
Normal	1
Lower	1.173(0.784-1.754)
Disability certification	
no	1
yes	0.978(0.732-1.303)
Education	
illiterate	1
1–6 years	1.362(0.946-1.962)
Junior high school and above	1.097(0.784-1.754)
Living arrangement	
Living alone	1
Not living alone	1.117(0.670-1.861)
Primary caregiver	
No caregiver	1
Having a caregiver	0.914(0.552-1.514)
Geriatric conditions	
no condition	1
any one condition	1.266(0.896-1.787)
Mean no. of chronic diseases	1.048(0.955-1.151)

Functional limitation	
Mild/moderate	1
severe	1.622(1.139-2.311)**
Special care need	
no	1
yes	1.491(1.052-2.114)*
Cognitive impairment	
normal	1
impairment	0.871(0.633-1.198)
Conscious	
clear	1
unclear	1.391(0.981-1.974)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

4.3.3 HCBS Use and Nursing Home Admission

During the study period, 43 seniors (12.57%) in the user group admitted to a nursing home, as compared with 35 seniors (12.24%) in the non-user group (p =0.899).

The risk of being admitted to nursing home did not differ significantly between user and non-user groups (unadjusted hazard ratio [HR] 0.93 [95% CI 0.60–1.46, p=0.800). When covariates were controlled in the model, the adjusted HR was 0.87 (95% CI, 0.55–1.37), p=0.546. In summary, there was no significant difference in nursing home admission between the two groups (Table 15). To test if utilizing more items of HCBS had positive effect on elder's nursing home admission, the utilization of HCBS was categorized by number of service items used (0= no use; 1= only one service use; 2= two or more services use). When covariates were controlled in the model, there was no significant difference in nursing home admission between these three groups.

Table 15 Cox Regression of the Association Between HCBS utilization and Nursing Admission (n = 628)

Factors	Haz. Ratio (95% CI)
HCBS utilization	
no	1
yes	0.868(0.548-1.375)
Age (years)	
65-74	1
75-84	1.009(0.5611-1.813)
≥85	1.434(0.486-1.905)
Gender	
Female	1
Male	2.237(1.329-3.767)**
Marital Status	
Single	1
Married	0.934(0.551-1.583)
Household Income Level	
Normal	1
Lower	1.169(0.626-2.181)
Disability certification	
no	1
yes	0.988(0.611-1.600)
Education	
illiterate	1
1–6 years	0.755(0.429-1.329)
Junior high school and above	0.616(0.312-1.213)
Living arrangement	
Living alone	1
Not living alone	1.093(0.503-2.372)
Primary caregiver	
No caregiver	1
Having a caregiver	0.682(0.306-1.519)
Geriatric conditions	
no condition	1
any one condition	1.164(0.685-1.975)
Mean no. of chronic diseases	1.061(0.969-1.162)
Functional limitation	

Mild/moderate	1
severe	0.888(0.750-1.051)
Special care need	
no	1
yes	0.555(0.242-1.273)
Cognitive impairment	
normal	1
impairment	1.170(0.668-2.051)
Conscious	
clear	1
unclear	1.377(0.711-2.665)

* p < 0.05 ** p < 0.01 *** p < 0.001

4.3.4 HCBS Use and Change in Functional Status

During the 27 months follow-up period, 217 elders who died, 76 elders who admitted to nursing homes, 4 elders who moved away and 2 elders who lost to follow-up were excluded since their functional dependence data and caregiving burden were not available. 329 elders covered by the LTCP were analyzed for the change in functional status and caregiver's burden. At the end of follow-up, 145 (75.13%) of 193 seniors in the user group had sustained or improved their functional status, as compared with 94 (69.12%) of 136 seniors in the non-user group (p =0.109). The detailed results of a multiple logistic regression are shown in Table 16. When covariates, including age, sex, marital status, education, household income level, living status, conscious, number of chronic diseases, disability certification, cognitive function, ADL score were adjusted in the model, there was no significant difference in the change in functional status between two groups. The odds ratio is 0.598, which indicates that elders who received HCBS is 0.598 times less likely to sustain or improve functional status than those not using HCBS. However, there were statistically significant for education, cognitive ability and functional limitation. The elders with 1–6 years education were significantly having lower ratio of sustaining or improving in functional status comparing to illiterate elders (OR = 0.296; CI, 0.123 - 0.711). In addition, elders having cognitive disability were significantly having lower possibility of sustaining or improving in functional

status comparing to normal elderly (OR = 0.578; CI, 0.408 - 0.820). Moreover, those classified as less dependent for functional status were significantly having lower possibility of sustaining or improving in functional status (OR = 0.928; CI, 0.906-0.950), and for each 1-score increase in ADL, the possibility of improving or sustaining one's functional status decreased by an estimated 7% (see Table16).

In order to identify if utilizing more items of HCBS had positive effect on elder's functional status, the utilization of HCBS was categorized by items used (0= no use; 1= only one service use; 2= two or more services use). The detailed results of a multiple logistic regression are shown in Table 17. When covariates were controlled, the elders using two or more HCBS services were less likely to sustain or to improve in functional status than non-user group. The odds ratio is 0.393, which indicates that elders who used two or more HCBS is 0. 393 times less likely to sustain or to improve in functional status than those not using HCBS.

Due to the fact that severe disable elders, especially those who are long-term bedridden, are nearly impossible to improve in functional status, elders with ADL score more than 20 (not total dependence) at the baseline were analyzed to exclude the confounding effects of the physical condition of the users. Finally, 270 elders were analyzed for the change in functional status. Of these, 105 (68.63%) of 153 seniors in the utilization group had sustained or improved their functional status, as compared with

75 (64.10%) of 117 seniors in the control group. The detailed results of a multiple logistic regression are shown in Table 18. When covariates were controlled, the result showed that there was no significant difference in the change of functional status between user group and non-user groups (see Table 18). I further analyzed if more items of HCBS use had positive effect on elder's functional status, and the results revealed that when covariates were controlled, the elders using two or more HCBS services were significantly less likely to sustain or to improve in functional status than non-user group. The odds ratio is 0.404, which indicates that elders who used two or more HCBS is 0.404 times less likely to sustain or to improve in functional status than those not using HCBS. (see Table 19)

Table 16 Multivariate Statistical Analysis for Changing in Functional Status and HCBS Use

Factors	OR	95% C.I.	P
HCBS utilization			
yes	0.598	0. 306- 1.162	0.129
no	1		
Age (years)			
65-74	1		
75-84	0. 858	0. 390-1.886	0.703
≥85	0. 537	0.217-1.332	0.180
Gender			
Female	1		
Male	1.396	0. 657- 2.967	0.385
Marital Status			
Single	1		
Married	0.975	0.488 -1.947	0.942
Household Income Level			
Normal	1		
Lower	1.993	0. 750- 5.294	0.167
Disability certification			
no	1		
yes	0.510	0.244- 1.068	0.074
Education			
illiterate	1		
1–6 years	0.296	0.123 - 0.711	0.007*
Junior high school and above	0.664	0.233–1.894	0.444
Living arrangement			
Living alone	1		
Not living alone	1.071	0. 432- 2.670	0.882
Primary caregiver			
No caregiver	1		
Having a caregiver	1.358	0.393- 4.695	0.629
Geriatric conditions			
no condition	1		
any one condition	0.811	0.383-1.714	0.583
Mean no. of chronic diseases	0. 957	0.757-1.209	0.712
Functional limitation	0.928	0.906-0.950	0.000*

Special care need			
no	1		
yes	1.869	0.176- 19.888	0.604
Cognitive impairment			
normal	1		
impairment	0.580	0.408- 0.823	0.002
Conscious			
clear	1		
unclear	0.574	0.136-2.430	0.451

* p < 0.05 ** p < 0.01 *** p < 0.001

Model fit:

Pearson chi2(309) = 256.81

Prob > chi2 = 0.9862

Table 17 Multivariate Statistical Analysis for Changing in Functional Status and HCBS Using Items

Factors	OR	95% C.I.	P
HCBS utilization			
1 service	0.765	0.356-1.165	0.494
2 or more services	0.393	0.162-0.953	0.039*
No service	1		
Age (years)			
65-74	1		
75-84	0. 878	0.398-1.939	0.748
≥85	0. 610	0.243-1.532	0.293
Gender			
Female	1		
Male	1.391	0.650- 2.973	0.395
Marital Status			
Single	1		
Married	0.980	0.489-1.967	0.956
Household Income Level			
Normal	1		
Lower	2.263	0.834-6.140	0.109
Disability certification			
no	1		
yes	0.529	0.252-1.140	0.094
Education			
illiterate	1		
1–6 years	0.300	0.124-0.711	0.008*
Junior high school and above	0.731	0.255-2.097	0.560
Living arrangement			
Living alone	1		
Not living alone	1.049	0.417-2.640	0.882
Primary caregiver			
No caregiver	1		
Having a caregiver	1.437	0.411-5.020	0.570
Geriatric conditions			
no condition	1		
any one condition	0.799	0.376-1.697	0.559
Mean no. of chronic diseases	0.957	0.755-1.214	0.717

Functional limitation	0.924	0.901-0.947	0.000*
Special care need			
no	1		
yes	1.829	0.170-19.645	0.618
Cognitive impairment			
normal	1		
impairment	0.588	0.412-0.838	0.003*
Conscious			
clear	1		
unclear	0.597	0.136-2.615	0.494

* p < 0.05 ** p < 0.01 *** p < 0.001

Model fit:

Pearson chi2(308) = 282.07

Prob > chi2 = 0.8528

Table 18 Multivariate Statistical Analysis for Changing in Functional Status and HCBS Use with ADL>20

Factors	OR	95% C.I.	P
HCBS utilization			
yes	0.611	0. 314- 1.188	0.146
no	1		
Age (years)			
65-74	1		
75-84	0. 856	0.390-1.879	0.698
≥85	0. 536	0.217-1.327	0.178
Gender			
Female	1		
Male	1.390	0. 654- 2.952	0.392
Marital Status			
Single	1		
Married	0.971	0.487-1.935	0.933
Household Income Level			
Normal	1		
Lower	1.987	0.750- 5.264	0.167
Disability certification			
no	1		
yes	0.507	0.243- 1.059	0.071
Education			
illiterate	1		
1–6 years	0.298	0.124- 0.715	0.007*
Junior high school and above	0.655	0.230–1.866	0.429
Living arrangement			
Living alone	1		
Not living alone	1.077	0. 436- 2.663	0.872
Primary caregiver			
No caregiver	1		
Having a caregiver	1.381	0.401- 4.759	0.609
Geriatric conditions			
no condition	1		
any one condition	0.819	0.390-1.722	0.599
Mean no. of chronic diseases	0.964	0.763-1.220	0.763
Functional limitation	0.931	0.908-0.954	0.000*

Special care need			
no	1		
yes	1.807	0.166- 19.620	0.627
Cognitive impairment			
normal	1		
impairment	0.578	0.408- 0.820	0.002*
Conscious			
clear	1		
unclear	0.559	0.130-2.409	0.435

* p < 0.05 ** p < 0.01 *** p < 0.001

Model fit:

Pearson chi2(251) = 249.44

Prob > chi2 = 0.5159

Table 19 Multivariate Statistical Analysis for Changing in Functional Status and HCBS Using Items with ADL>20

Factors	OR	95% C.I.	P
HCBS utilization			
1 service	0.781	0.364-1.678	0.527
2 or more services	0.404	0.166-0.980	0.045*
No service	1		
Age (years)			
65-74	1		
75-84	0. 876	0.397-1.933	0.744
≥85	0. 609	0.243-1.527	0.291
Gender			
Female	1		
Male	1.389	0.650- 2.969	0.396
Marital Status			
Single	1		
Married	0.977	0.488-1.955	0.947
Household Income Level			
Normal	1		
Lower	2.253	0.832-6.098	0.110
Disability certification			
no	1		
yes	0.527	0.251-1.106	0.090
Education			
illiterate	1		
1–6 years	0.302	0.125-0.729	0.008*
Junior high school and above	0.719	0.251-2.063	0.540
Living arrangement			
Living alone	1		
Not living alone	1.054	0.421-2.643	0.910
Primary caregiver			
No caregiver	1		
Having a caregiver	1.458	0.418-5.081	0.554
Geriatric conditions			
no condition	1		
any one condition	0.808	0.382-1.707	0.576
Mean no. of chronic diseases	0.963	0.759-1.222	0.757

Functional limitation	0.927	0.903-0.951	0.000*
Special care need			
no	1		
yes	1.757	0.160-19.298	0.645
Cognitive impairment			
normal	1		
impairment	0.587	0.412-0.837	0.003*
Conscious			
clear	1		
unclear	0.589	0.132-2.620	0.487

* p < 0.05 ** p < 0.01 *** p < 0.001

Model fit:

Pearson chi2(269) = 249.44

Prob > chi2 = 0.5159

4.3.5 HCBS Use and Change in Caregiving Burden

With regard to the change in caregiving burden, of the 329 elders, 20 (7.53%) elders who had no caregiver and 69 (15.36%) elders who were cared by foreign caregivers were excluded because the data of caregiver's burden were not available. Finally, 240 elders were analyzed. Of these, 58 (35.80%) of 162 seniors in the utilization group had improved their caregiving burden, as compared with 24 (30.77%) of 78 seniors in the control group (p =0.593). The detailed results of a multiple logistic regression were shown in Table 20. Comparing to the non-user group, there was no difference in the change in caregiver's burden. Marital status was the only factor significantly associated with the change in caregiver's burden. The elders who were married were 2.864 times the ratio of improving in functional status than those were single (OR = 2.864; CI, 1.465 -5.560). (see Table 20)

In order to identify if more items of HCBS utilization had positive effect on caregiving burden, the use of HCBS was categorized by items used (0= no use; 1= only one service use; 2= two or more services use) to explore whether the use of a home/community long-term care service was associated with change in caregiving burden. The detailed results of a multiple logistic regression are shown in Table 21. When covariates were controlled, there was no difference in the change in caregiver's burden. Marital status is still the only factor significantly associated with the change in

caregiver's burden. (OR = 2.876; CI, 1.480 -5.588). (see Table 21)

Table 20 Multivariate Statistical Analysis for Changing in Caregiving Burden and HCBS Use

Factors	OR	95% C.I.	P
HCBS utilization			
yes	1.033	0. 542-1.971	0.921
no	1		
Age (years)			
65-74	1		
75-84	0.718	0.353- 1.460	0.360
≥85	1.097	0.460- 2.616	0.835
Gender			
Female	1		
Male	0.584	0.286-1.193	0.140
Marital Status			
Single	1		
Married	2.864	1.465 -5.560	0.002*
Household Income Level			
Normal	1		
Lower	2.133	0.932-4.878	0.073
Disability certification			
no	1		
yes	1.267	0.671-2.392	0.465
Education			
illiterate	1		
1–6 years	1.170	0.550 - 2.491	0.683
Junior high school and above	0.733	0.296– 1.818	0.503
Living arrangement			
Living alone	1		
Not living alone	0.411	0.146- 1.156	0.092
Geriatric conditions			
no condition	1		
any one condition	1.174	0.553-2.492	0.676
Mean no. of chronic diseases	1.193	0.955-1.490	0.121
Functional limitation	0.989	0.975-1.004	0.140
Special care need			
no	1		
yes	0.648	0.240-1.748	0.392

Cognitive impairment			
normal	1		
impairment	0.788	0.5783- 1.075	0.132
Conscious			
clear	1		
unclear	0.375	0.125-1.127	0.068

* p < 0.05 ** p < 0.01 *** p < 0.001

Model fit:

Pearson chi2(222) = 240.23

Prob > chi2 = 0.1910

Table 21 Multivariate Statistical Analysis for Changing in Caregiving Burden and HCBS Using Items

Factors	OR	95% C.I.	P
HCBS utilization			
1 service	1.046	0. 479-2.286	0.909
2 or more services	0.953	0.422-2.155	0.908
No service	1		
Age (years)			
65-74	1		
75-84	0.729	0.357-1.491	0.387
≥85	1.118	0.466-2.683	0.803
Gender			
Female	1		
Male	0.585	0.286-1.197	0.142
Marital Status			
Single	1		
Married	2.876	1.480 -5.588	0.002*
Household Income Level			
Normal	1		
Lower	2.168	0.941-4.998	0.069
Disability certification			
no	1		
yes	1.274	0.674-2.406	0.456
Education			
illiterate	1		
1–6 years	1.181	0.554 - 2.516	0.666
Junior high school and above	0.743	0.299– 1.846	0.522
Living arrangement			
Living alone	1		
Not living alone	0.413	0.147-1.165	0.095
Geriatric conditions			
no condition	1		
any one condition	1.183	0.557-2.512	0.662
Mean no. of chronic diseases	1.190	0.949-1.492	0.133
Functional limitation	0.989	0.975-1.003	0.136
Special care need			
no	1		

yes	0.642	0.238-1.732	0.382
Cognitive impairment			
normal	1		
impairment	0.792	0.580- 1.081	0.142
Conscious			
clear	1		
unclear	0.376	0.125-1.131	0.082

* p < 0.05 ** p < 0.01 *** p < 0.001

Model fit:

Pearson chi2(221) = 240.17

Prob > chi2 = 0.1792

Chapter 5 Discussion

This study aimed to understand the home- and community- based long term care services received by community dwelling dependent elderly in Taiwan and to explore the factors and effects associated with the utilization. In contrast to the previous Taiwan study concentrating on residents in long-term care facilities (Li et al. 2011; Ku et al. 2013), our study focuses on community-dwelling elders and allows us to assess the associations at the community level.

This chapter first summarizes and discusses the findings following the organization of the conceptual framework. It then closes with study limitations, implications, and final conclusions.

5.1 Utilization of HCBS

The results of the study demonstrated that among those newly certified by "Long Term Care Program", 63.37% of elders had received at least one home/community based long term care services, while 36.63% did not receive any service at the first month. It means that even though care managers had managed a care plan for these elders, there are still one third of disable elders refusing to use these services. This study result was similar to other studies.

Literature consistently pointed out that older adults and their caregivers

underutilize these services (Brodaty, Thomson, Thompson, & Fine, 2005) and the prevalence of unmet need for HCBS was high (Mitra et al., 2011). In addition, the underutilization of services and unmet care needs lead to undesirable outcomes for the elderly (Sands et al., 2006; Gaugler, Kane, Kane, & Newcomer, 2005). Moreover, lack of information and care recipient refusal were the barriers for unmet HCBS needs (Casado et al. 2010; Casado and Lee 2012). Likewise, Cattagni Kleiner et al.'s study (2017) also showed that the functionally vulnerable group did not know where to look for information on various HCBS services than robust and dependent ones and suggested the efforts should be made to improve elders' access to HCBS information by developing specific strategies. This study shows that we should increase the amount of knowledge about all of these services to the elders and their families. Therefore, being on the front line, care manager should be made aware of the importance of their role in the dissemination of information.

Overall, among 9 types of home/community long term care services for disable elderly, the three most widely used services were homecare (57.92%), transportation (16.12%) and daycare (11.11%). The least used services were host family (0.37%). The study results in USA were a little different. Recent study in a national sample found that the most commonly reported HCBS were transportation services and other food or nutrition services other than meals on wheels (Sonnega et al.,2016). Another study in

New York also pointed out the three leading HCBS used by participants were senior centers, homemaker services, and transportation services (Ewen et al.,2017). On average, participants reported using less than one HCBS (Ewen et al.,2017). In Taiwan, homecare service was the most popular service. Perhaps this phenomenon was resulted from the fact that homecare service was the earliest home service provided in Taiwan. History of homecare service in Taiwan has begun in the end of 1980 and was expanded from 2002 due to the increasing demands of elderly (Wu, 2004). Since then the manpower and the usage of homecare experienced continued to grow. So far, homecare service had become one of services in the social welfare system and aimed to help elderly, especially for low-income elderly to accept the daily life care. In the current study, the most widely used service was homecare (57.92%), as mentioned before, this result may be related to the fact that homecare service has been provided for many years and thus people were more familiar with it. As a result, the utilization of it was higher than other services. Huang et al. (2009) pointed out that Taiwanese preferred homecare service because that elders can stay at home and the families did not need to pick up elders. Furthermore, in addition to assisting the elders' personal care, the care attendant also offers other help for the family members such as doing domestic trivialities. Therefore, the acceptance rate was higher. However, high utilization of homecare does not mean that the elderly does not require other services. Perhaps it is the lack of understanding for other types of

services that they do not occur to approach the most suitable service. The low utilization rate of other types of services is an alert to long-term care service providers and policy makers, because the needs of the elders maybe under met. Based on this viewpoint, the care manager must play an important role in guiding the elderly and their families to use the right services.

The results of this study showed that 83.53% of the HCBS users used only one service, 14.02 % used two services, and 2.45% used three or more services. This does not mean the elderly need only one service, instead, it implied that diversified home/community based long term care services have not gained popularity and recognized by the elders and families in Taiwan. Two reasons might explain why these services were not fully used. First, community-dwelling dependent elders are not always aware of their own needs including medical, psychosocial, functional and mobility needs which may be provided by HCBS. Second, disable elders or their families are often unaware of the HCBS available in the community. Lacking knowledge about the availability and utility of a service to alleviate their burdens may be a major barrier to service utilization among community-dwelling dependent elders. In Taiwan LTCP, a care manager played an important role in assessing and guiding the utilization of long term care services. Therefore, developing care managers' professional abilities would be very important for the future policy.

The new ten-year “Long-term Care Plan 2.0” is an extension of the original plan that was approved by Taiwan Government in 2007. The revised iteration is designed to have a more local-level focus and to integrate community-based care system that promotes “aging in place” while offering diverse options to meet long-term care needs. This policy echoes the results of the current study.

5.2 Factors Associated with the Utilization of HCBS

Overall, our results suggest that specific enabling factors and need factors were more important than predisposing factors in determining HCBS utilization for this sample. The use of home and community-based long term care services was associated with enabling factors including household income level, education, disability certification; and the need factors including geriatric conditions, functional limitation, cognitive impairment, conscious. The elder, who belongs to little lower income or lower income household and has both geriatric conditions and higher care needs, was more likely to use home and community-based long term care services.

Needs factors are the most significant correlated identifies, which are consist with the service utilization model proposed by Andersen (1995). In this study, the functional limitation represented the physical needs of elders, and those who belongs to moderate and severe disability were significantly associated with greater HCBS use. This result

is compatible with findings from other studies (Ku, Liu & Wen, 2013; Mcauley, Spector & Nostrand, 2009; Wu et al., 2014). However, based on the former result, we found that the moderate functional limitation displayed a greater effect on utilization than severe disability. Moreover, the elders having severe/critical disability certification, being severe cognitive impairment and unclear conscious were significantly associated with less likely use of HCBS. The possible reason might associate with the policy of hiring foreign care workers in Taiwan.

The policy of hiring foreign care workers in Taiwan started from 1992. Elderly people with severe functional or cognitive disabilities can apply for foreign care workers with less expenses when compared to native Taiwanese care workers. Since it is relatively cheap in hiring foreign care workers, many families considered it as an option for the elderly to "age at home" instead of going to an institution. According to a report by Taiwan Association of Family Caregivers, it is said that 28% of community-dwelling elderly with disabilities in Taiwan were taken care by foreign care workers. Since then Taiwan government has begun to launch "Ten Yeas LTCP", and they tried to constrain the growth of foreign care workers with various policy initiatives. They encourage families to hire local care workers and to use home and community based long term care services. Meanwhile, one of policy to constrain the growth of foreign care workers was the restriction in using some of the services in "Ten Year LTCP". Therefore, when there

were disable elderly in families, especially who had severe disability or dementia and need more help, they tend to hire the cheaper foreign care workers instead of using HCBS. If the care of disable elderly in Taiwan were still relying on foreign care workers, there may still be a gap between the home/community-based care provisions in LTC service delivery and the needs of elderly and their families.

The current study found that the factors associated with the utilization of home based services and the utilization of community based services were different. Need factors such as functional limitation, geriatric condition, cognitive disabilities, conscious were significantly associated with the likelihood of using home-based care. However, these factors were not significantly associated with using community-based care. The factors affecting the utilization of community based services were marital status, household income level, education and caregiver. The elders with single status, lower income, lower education level, and no caregiver showed significant associations with less likelihood of using community-based LTC services. This finding reflects that the elders with more functional limitation would like to receive services at home or hire foreign care workers because they might have difficulties in moving, and the elders who were single with no caregivers would like to receive community-based services. This finding points to the importance of family support in the community-based long term care services.

5.3 Effects of HCBS utilization

The “Ten Year LTCP “was implemented in October 2007 to provide better health care for older adults to keep their physical function and to allow the elderly to live independently in their homes as long as possible. As a result, the outcome of this policy has become an important health care services for older adults in Taiwan.

The presence of a disease and its severity at the time of the first certification could be confounding factors, since they could lead to the mortality or institutionalization of the subject (Stuck et al.,2002; Elkan et al., 2001; Banaszak-Holl et al.,2004; Gaugler et al.,2007). In our study, we took this factor into consideration by adjusting for the number of chronic diseases, which would serve as a proxy indicator of the severity of illness. The result showed that number of chronic diseases did not have significant effect on mortality and nursing home admission.

The effects of home and community-based LTC service utilization in reducing mortality and nursing home admission (Mayo-Wilson et al.,2014). The results of this study showed that the elders who used home and community-based serves represented a 40 percent lower hazard (risk) of death than non-users during a 27-month follow up period, which was consistent with the finding of Ku et al. (2013) and Akamigbo & Wolinsky (2006). As for nursing home admission, the users of home and community-based serves represented a 14 percent lower hazard (risk) than non-users. However,

there was no significant difference between these two groups. One possible reason might explain this result. As mentioned before, there were many families hiring foreign care workers to care the elders with severe disable or cognitive impairment instead of using HCBS. However, the care quality and the language barrier of foreign care workers might result in severe problems related to mortality.

The "Ten Year LTCP" was implemented to prevent a decline in functional status and allow the elderly to live independently in their homes as long as possible. However, our findings do not know significant difference between users and non-user groups in the change of functional status. There tended to be more sustain or improvement in the functional status for elders without disability certification than those with disability certification, in those having more chronic diseases, and in those with severe functional limitation. This result was not consistent with the previous studies (Beswick et al., 2008; Muramatsu et al., 2010). We speculate the possible reasons for this controversy findings. First, the assessment of functional status might differ with the change of care managers since the staff has high turnover. This limitation, however, may have resulted in different assessment standard for the functional status. Second, the medical condition of elders is an important concern related to the HCBS use and the change of functional status in LTCP participants. However, the study does not have the real data of individual medical conditions. Third, the severe disable elderly, especially those who are long-term

bedridden, are almost impossible to improve in functional status. In this study, we selected the subgroup of ADL score>20 to exclude the confounding effects of the physical condition of the users. However, there was no significant difference in the change of functional status among user group and non-user groups.

Although in this current study that there was no significant difference between users and non-user groups in the improvement in functional status. However, previous research in Taiwan has shown that physical function difficulties trajectories related to later long-term care utilization, and a long-term disability from an early age are more likely to use nursing homes than using care assistants at home. The study also suggested that the promotion, intervention or maintenance of physical function to target groups in early stage is necessary (Hsu, 2013). Therefore, it may be necessary to focus more in guiding and educating the elders and their families to use more HCBS to maintain elders' function ability.

Home- and community- based long term care services were intended to support family caregivers and to extend the ability of the care recipient for remaining in the community and in the setting of their choice. However, the result of this study showed that only about one third of caregivers had improved in burden. After controlling for other covariates, there was no significant difference in the change of caregiver's burden between user group and non-user groups. This result was not consistent with

previous studies (Lecovich, 2008; Tretteteig et al., 2016). A possible inference of this result may be that most elders with severe disability were admitted to nursing home or had hired foreign workers to take care of, and these elders were excluded in this analysis since there was no data about caregiver's burden so the change in burden was small. In addition, the characteristics of family caregivers could possibly affect burden of caregivers and this study, however, used a secondary data source so we could not get these data.

To sum up, utilization of home-and community-based long term care services only had positive effects on mortality, and it was disappointing to find that users did not have positive impact on nursing admission as well as improvement in functional status and caregivers' burden. However, in the present study, about 91.59% of older adults who were receiving home- and community-based long-term care services had family caregivers. This is similar to previous studies in American, Korea, and Japan (Kane et al. 2013; Kim et al.,2013; Tamiya et al. 2002). Therefore, the role of family caregiver and how to decrease caregiving burden are still important issues.

5.4 Limitations of the Study

In spite of some limitations in this study, the study results also provided useful references for the future study and policy making. The limitations of this study and

recommendations are as follows. First, this study conducts a secondary analysis using the LTCP data set, and some variables which are important for predicting the type and amount of home- and community-based services utilization was not included in LTCP. For example, belief-related variables were known to be one of the most important factors of the predisposing characteristic component in the health behavioral model. However, belief-related measures were not possible in the model analysis because of lack of appropriate question items in LTCP data. Therefore, belief-related variables are suggested in the future study for better understand the factors associate with the utilization. Second, the convenience nature of the population under study presents limitations and prohibits generalization to the population at large. This sample of older adults receiving government funded long term care plan in Chiayi City which should not be viewed as a representative sample of all long term care recipients in Taiwan. Third, the study used assessment data that were collected and recorded by many different care managers in the course of arranging for long term care services. There researchers cannot control the inter-rater reliability. Fifth, the follow-up period of our study may also limit our findings. 27 months may be a relatively short period to observe the outcomes needing a longer follow-up evaluation, for example mortality rate. To better understand the outcome of HCBS utilization, a long time longitudinal study is suggested to help clarify the changes in care recipients, changes in caregiver's burden

and the services use of the elderly over time and help to determine what type of services are needed at different stages of caregiving.

5.5 Study Implications

The purpose of this dissertation research was to provide empirical evidence for policy-making so that they could therefore offer better support for the elders in communities by home/community-based services. The results of the study demonstrated that 63.37 percent of elders who were newly certified for "Long Term Care Program" had received at least one home/community based long term care services, and 36.63 percent of them did not receive any service at the first month. It means that even care managers had managed a care plan for these elders, there are still 36.63 percent of disable elders refusing to receive these services. Therefore, it is worth noting what account for these causes. In addition, the result showed that most widely used service was homecare service (57.92%), and others were not often used; besides, 83.53 percent of the HCBS users used only one service. These results implied that diversified home/community based long term care services have not gained popularity in Taiwan. The low utilization rates of other types of services is a red flag for long-term care service providers and policy makers. It is likely that elders lack knowledge about the availability and utility of a service to alleviate their needs. In Taiwan LTCP, care manager played

an important role in assessing and guiding the utilization of long term care services, and thus developing care managers' professional abilities would be very important for the future policy. The new ten-year "Long-term Care Plan 2.0" is designed to have a more local-level focus, to integrate community-based care system that promotes "aging in place" and to offer diverse options to meet long-term care needs. This policy echoes the results of the current study.

Overall, the findings provide useful information about factors affecting home- and community-based services (HCBS) and the effects of services utilization. The findings of the study revealed that income was an important factor affecting HCBS utilization. Utilization intensity was higher among people with lower income levels. This finding implies the LTCP in Taiwan and its subsidy policy certainly does decrease barriers in accessing to LTC for little low and low income elders. However, this finding also suggests that a lower co-payment rate in normal income elders is needed to facilitate a higher level of LTC utilization.

In the present study sample, utilization was directly proportional to the level of functional limitation and to the independent of geriatric conditions. Therefore, policies which aim to achieve a compression of the disability burden would contribute to alleviating the societal consequences of population aging. The result of this study showed that cognitive impairment was associated with lower utilization of HCBS. This

finding implies that the services handling dementia care probably does not meet elders' need so they did not use the services. Therefore, policies should be emphasized on the dementia resource deployment.

Except for mortality, this study did not find positive impact on nursing home admission, improvement in functional status and caregiving burden between HCBS users and non-users. Possibly the sample size of the follow up cohort was too small and the follow period was too short in this study. However, along with the aging population, it is now time to make changes in support of improved services to elders and further deinstitutionalization of seniors who could continue to live in the community with adequate support.

The present study offers several avenues for future research. First, longitudinal studies would help to examine the changes in care recipients, caregiver and their services use over time and help to determine what type of services are needed at different stages of caregiving. Second, population based longitudinal studies are necessary to identify factors that may contribute to increased service use and the reason why service users use so few services. Third, the low utilization of HCBC found in the study pointed out that diversified home/community based long term care services have not gained popularity in Taiwan and the fragmentation of community-based long-term care has been continued criticized. Now the long term care plan 2.0 has been launched in 2017

and future research can then evaluate the effectiveness of the integrated long-term care service model.

Reference

1. Akamigbo, A. B., & Wolinsky, F. D. (2006). Reported expectations for nursing home placement among older adults and their role as risk factors for nursing home admissions. *The Gerontologist*, *46*(4), 464–473.
2. Albert, S., Simone, B., Brassard, A., Stern, Y. and Mayeux, R. (2005). Medicaid home care services and survival in New York City. *The Gerontologist*, *45*(5), 609-616.
3. Alkema, G., Reyes, J. and Wilber, K. (2006). Characteristics associated with home- and community-based service utilization for Medicare managed care consumers. *The Gerontologist*, 46(2), 173-182.
4. Andersen, R. M. (1968). *A behavioral model of families' use of health services*. Retrieved from https://ssa.uchicago.edu/sites/default/files/uploads/RS25.PDF
5. Andersen, R. (1995). Revisiting the behavioral model and access to medical care: does it matter? *Journal of Health and Social Behavior, 36*(1), 1-10.
6. Andersen, R., & Newman, J. F. (2005). Societal and individual determinants of medical care utilization in the United States. *The Milbank Quarterly*, *83*(4), 10.1111/j.1468–0009.2005.00428.x. http://doi.org/10.1111/j.1468-0009.2005.00428.x
7. APS Healthcare. (2005). Family care independent assessment: an evaluation of access, quality and cost effectiveness for calendar year 2003 - 2004. Available from: https://www.dhs.wisconsin.gov/familycare/reports/fc-indepassmt2005.pdf

[Accessed June 15, 2015].

8. Babitsch, B., Gohl, D., & von Lengerke, T. (2012). Re-revisiting Andersen's Behavioral Model of Health Services Use: A systematic review of studies from 1998–2011. *GMS Psycho-Social-Medicine, 9*, Doc11. doi:10.3205/psm000089
9. Banaszak-Holl J, Fendrick AM, Foster NL, Herzog AR, Kabeto MU, Kent DM,Straus WL, Langa KM. (2004): Predicting nursing home admission: estimates from a 7-year follow-up of a nationally representative sample of older Americans. *Alzheimer Disease & Associated Disorders, 18* (2):83-89.
10. Beswick, A. D., Rees, K., Dieppe, P., Ayis, S., Gooberman-Hill, R., Horwood, J., & Ebrahim, S. (2008). Complex interventions to improve physical function and maintain independent living in elderly people: a systematic review and meta-analysis. *Lancet, 371* (9614), 725–735. doi:10.1016/S0140-6736(08)60342-6
11. Blomgren, J., Martikainen, P., Martelin, T., & Koskinen, S. (2008). Determinants of home-based formal help in community-dwelling older people in Finland. *European Journal of Ageing, 5*(4), 335-347. doi:10.1007/s10433-008-0094-4
12. Bookwala, J., Zdaniuk, B., Burton, L., Lind, B., Jackson, S., & Schulz, R. (2004). Concurrent and Long-Term Predictors of Older Adults' Use of Community-Based Long-Term Care Services. *Journal of Aging and Health, 16*(1), 88-115.

doi:10.1177/0898264303260448

13. Borrayo, E., Salmon, J., Polivka, L., & Dunlop, B. (2002). Utilization across the continuum of long-term care services. *Gerontologist, 42*(5), 603-612.

14. Bouman, A., Rossum, E., Evers, S., Ambergen, T., Kempen, G., & Knipschild, P. (2008). Effects on health care use and associated cost of a home visiting program for older people with poor health status: A randomized clinical trial in the Netherlands. *J Gerontol a Biol Sci Med Sci., 63*(3), 291-297.

15. Bradley, E. H., McGraw, S. A., Curry, L., Buckser, A., King, K. L., Kasl, S. V., & Andersen, R. (2002). Expanding the Andersen model: the role of psychosocial factors in long-term care use. *Health Services Research, 37*(5), 1221–1242. doi:10.1111/1475-6773.

16. Brodaty, H., Thomson, C., Thompson, C., & Fine, M. (2005). Why caregivers of people with dementia and memory loss don't use services. *International Journal of Geriatric Psychiatry*, *20*(6), 537–546. doi:10.1002/gps.1322

17. Casado, B. L., Vulpen, K. S., & Davis, S. L. (2010). Unmet Needs for Home and Community-Based Services Among Frail Older Americans and Their Caregivers. *Journal of Aging and Health, 23*(3), 529-553. doi:10.1177/0898264310387132

18. Casado BL, Lee SE (2012) Access barriers to and unmet needs for home- and

community-based services among older Korean Americans. *Home Health Care Serv Q 31*(3):219–242. doi:10. 1080/01621424.2012.703540.

19. Cattagni Kleiner A, Santos-Eggimann B, Fustinoni S, Seematter-Bagnoud L. (2017). Access to information on home- and community-based services and functional status. *Int J Public Health.* doi: 10.1007/s00038-017-0990-5.

20. Chen YM, Thompson EA (2010) Understanding factors that influence success of home- and community-based services in keeping older adults in community settings. *J Aging Health 22*(3):267–291. doi:10.1177/0898264309356593

21. Chiayi City Government. Household Registration Service. Statistics of Population. Retrieved from: http://household.chiayi.gov.tw/popul02/index.aspx?Parser=99,7,39 [Accessed June 15, 2015].

22. Choi, G. N., & McDougall, G. (2009). Unmet needs and depressive symptoms among low-income older adults. *Journal of Gerontological Social Work*, *52*(6), 567–583. doi:10.1080/01634370802609270

23. Chung, M., Hsu, N., Wang, Y., Lin, H., Huang, Y., Amidon, R. L., & Kao, S. (2008). Factors Affecting the Long-Term Care Preferences of the Elderly in Taiwan. *Geriatric Nursing, 29*(5), 293-301. doi:10.1016/j.gerinurse.2007.09.003

24. Dalby, D. M., Sellors, J. W., Fraser, F. D., Fraser, C., van Ineveld, C., & Howard,

M. (2000). Effect of preventive home visits by a nurse on the outcomes of frail elderly people in the community: a randomized controlled trial. *Canadian Medical Association Journal, 162*(4), 497–500.

25. Dorin, L., Turner, S. C., Beckmann, L., große Schlarmann, J., Faatz, A., Metzing, S., & Büscher, A. (2014). Which need characteristics influence healthcare service utilization in home care arrangements in Germany? *BMC Health Services Research*, *14*, 233. http://doi.org/10.1186/1472-6963-14-233

26. Dalby, D. M., Sellors, J. W., Fraser, F. D., Fraser, C., van Ineveld, C., & Howard, M. (2000). Effect of preventive home visits by a nurse on the outcomes of frail elderly people in the community: a randomized controlled trial. *CMAJ: Canadian Medical Association Journal*, *162*(4), 497–500.

27. de Jong P, Rouwendal J, van Hattum P, Brouwer A (2012). Housing Preferences of an Ageing Population: Investigation in the Diversity Among Dutch Older Adults. Netspar Discussion Paper No. 07/2012-024. Retrieved from: https://ssrn.com/abstract=2120458 or http://dx.doi.org/10.2139/ssrn.2120458

28. Elkan, R., Kendrick, D., Dewey, M., Hewitt, M., Robinson, J., Blair, M., … Brummell, K. (2001). Effectiveness of home based support for older people: systematic review and meta-analysis. *BMJ : British Medical Journal*, *323*(7315), 719.

29. Ewen HH, Washington TR, Emerson KG Carswell AT, Smith M. (2017). Variation in older adult characteristics by residence type and use of home- and community-based services. *Int. J. Environ. Res. Public Health, 14*(3), 330; doi:10.3390/ijerph14030330

30. Gaugler JE, Duval S, Anderson KA, Kane RL. (2007). Predicting nursing home admission in the U.S: a meta-analysis. *BMC Geriatr, 7*,13. DOI: 10.1186/1471-2318-7-13

31. Gaugler, JE., Kane, RL., Kane, RA., & Newcomer, R. (2005). Early community based service utilization and its effects on institutionalization in dementia caregiving. *The Gerontologist*, *45*(2), 177–185. doi:10.1093/geront/45.2.177

32. Gaugler, J.E. (2014). The evolution of community based long-term care. *J. Appl. Gerontol. 33*(2), 127–129.

33. Harris-Kojetin L, Sengupta M, Park-Lee E, Valverde R. (2013). *Long-term care services in the United States: 2013 overview.* National Center for Health Statistics. Vital Health Stat 3(37).

34. Health Canada (2004). *Long-term facilities-based care*. Retrieved September 14, 2017, from https://www.canada.ca/en/health-canada/services/home-continuing-care/long-term-facilities-based-care.html

35. Health Canada (2004). *Home and community health care.* Retrieved September 14,

2017, from https://www.canada.ca/en/health-canada/services/home-continuing-care/home-community-care.html

36. HHS. *What is long-term care?* Washington, DC: HHS. 2015. Retrieved from: http://longtermcare.gov/thebasics/what-is-long-term-care/ [Accessed February 10, 2015].

37. Hoi, L. V., Thang, P., & Lindholm, L. (2011). Elderly care in daily living in rural Vietnam: Need and its socioeconomic determinants. *BMC Geriatrics, 11*(1). doi:10.1186/1471-2318-11-81

38. Hong , M. & Casado, B.L. (2015). Caregiver Stress: Does States' Expenditure on Home- and Community-Based Services Matter? *Home Health Care Services Quarterly, 34*(2), 85-100, DOI: 10.1080/01621424.2015.1029186

39. Hsu HC. (2013). Effects of physical function trajectories on later long-term care utilization among the Taiwanese elderly. *Geriatr Gerontol Int.,13* (3):751–758. doi: 10.1111/j.1447-0594.2012.00964.x

40. Huang HL, Shyu YI, Chang MY, Weng LC, Lee I. (2009). Willingness to use respite care among family caregivers in Northern Taiwan . *J Clin Nurs. 18*(2):191-8. doi: 10.1111/j.1365-2702.2008.02538.x.

41. Huss, A., Stuck, A., Rubenstein, L., Egger, M., & Clough-Gorr, K. (2008). Multidimensional geriatric assessment: back to the future multidimensional

preventive home visit programs for community-dwelling older adults: a systematic review and meta-analysis of randomized controlled trials. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 63*(3), 298-307.

42. Johnson, R., & Wolinsky, F. (1996). Use of Community-Based Long-Term Care Services by Older Adults. *Journal of Aging and Health, 8*(4), 512-537.

43. Kadushin, G. (2004). Home Health Care Utilization: A Review of the Research for Social Work. *Health & Social Work, 29*(3), 219-244.

44. Kane, R. A., Kane, R. L., & Ladd, R. C. (1998). *The heart of long term care* . Oxford University Press.

45. Kane, R., Lum, T., Kane, R., Homyak, P., Parashuram, S., & Wysocki, A. (2013). Does Home- and Community-Based Care Affect Nursing Home Use? *Journal of Aging & Social Policy, 25*(2), 146-160.

46. K Kato, G., Tamiya, N., Kashiwagi, M., Sato, M., & Takahashi, H. (2009). Relationship between home care service use and changes in the care needs level of Japanese elderly. *BMC Geriatrics*, 9, 58. doi:10.1186/1471-2318-9-58.

47. Kim, H., Kwon, S., Yoon, N., & Hyun, K. (2013). Utilization of long-term care services under the public long-term care insurance program in Korea: Implications of a subsidy policy. *Health Policy, 111*(2), 166-174.

48. Kim, H. (2015): *Community-based Long-term Care, Korea*. UNESCAP Forum on

Population Aging. Tokyo, 7 Nov. 2015.

49. Kochera, A., & Straight, A., Guterbock (n.d.). Beyond 50.05: A Report to the Nation on Livable Communities Creating Environments for Successful Aging. Washington, DC: AARP.

50. Koike, S., & Furui, Y. (2013). Long-term care-service use and increases in care-need level among home-based elderly people in a Japanese urban area. *Health Policy, 110*(1), 94-100.

51. Konetzka, R., Karon, S., & Potter, D. (2012). Users of medicaid home and community-based services are especially vulnerable to costly avoidable hospital admissions. *Health Affairs,31*(6), 1167-1175. doi: 10.1377/hlthaff.2011.0902.

52. Krout, J. A., Oggins, J., & Holmes, H. H. (2000). Patterns of service use in a continuing care retirement community. *Gerontologist, 40(6),* 698-705.

53. Ku, L., Liu, L., & Wen, M. (2013). Trends and determinants of informal and formal caregiving in the community for disabled elderly people in Taiwan. *Archives of Gerontology and Geriatrics, 56*(2), 370-376.

54. Lee J, Shannon J, Brown A. (2015). Characteristics of older Georgians receiving Older Americans Act Nutrition Program Services and other home and community based services: findings from the Georgia Aging Information Management System. *J Nutr Gerontol Geriatr. 34*(2), 168-188, DOI:

10.1080/21551197.2015.1031595

55. Lecovich E. (2008). Caregiving burden, community services, and quality of life of primary caregivers of frail elderly persons. *Journal of Applied Gerontology .27*(3):309-30. DOI: 10.1177/0733464808315289

56. Li, I., Fann, S., & Kuo, H. (2011). Predictors of the utilization of long-term care (LTC) services among residents in community-based LTC facilities in Taiwan. *Archives of Gerontology and Geriatrics, 53*(3), 303-308. doi:10.1016/j.archger.2010.11.009

57. Long Term Care Management Center, Chiayi City. Retrieved from: http://longcare.cichb.gov.tw/#1287 [Accessed June 15, 2015].

58. Marek, K., Popejoy, L., Petroski, G., Mehr, D., Rantz, M., & Lin, W. (2005). Clinical Outcomes of Aging in Place. *Nursing Research, 54* (3), 202-211.

59. Mayo-Wilson E, Grant S, Burton J, Parsons A, Underhill K, et al. (2014) Preventive Home Visits for Mortality, Morbidity, and Institutionalization in Older Adults: A Systematic Review and Meta-Analysis. *PLoS ONE 9*(3): e89257. doi:10.1371/journal.pone.0089257

60. Mcauley, W., Spector, W., & Nostrand, J. (2009). Formal home care utilization patterns by rural-urban community residence. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 64*(2), 258-268. doi:

10.1093/geronb/gbn003

61. McCall, N. (2001). *Who will pay for long term care?: Insights from the Partnership programs*. Chicago: Health Administration Press .

62. Meijer, C., Koopmanschap, M., Koolman, X., & Doorslaer, E. (2009). The role of disability in explaining long-term care utilization. *Medical Care, 47*(11), 1156-1163.

63. Meijer, C., Koopmanschap, M., Uva, T., & Doorslaer, E. (2011). Determinants of long-term care spending: Age, time to death or disability? *Journal of Health Economics, 30*(2), 425-438. doi: 10.1016/j.jhealeco.2010.12.010

64. Miller, N. (2011). Relations among home- and community-based services investment and nursing home rates of use for working-age and older adults: A state-level analysis. *American Journal of Public Health, 101*(9), 1735–1741. doi:10.2105/AJPH.2011.300163

65. Ministry of Health and Welfare, R.O.C. (2016). *2016Taiwan Health and Welfare Report.* Retrieved from https://www.mohw.gov.tw/lp-3196-1.html.

66. Ministry of Health and Welfare, R.O.C. (2016). *Report of the Long Term Care Insurance Plan.* Retrieved from http://www.mohw.gov.tw/dl-4079-f5ab23cf-d19f-4683-86e6-eee5423398f3.html

67. Ministry of Health and Welfare, R.O.C. (2016). *Long Term Care Plan 2.0*. Retrieved

from http://topics.mohw.gov.tw/LTC/cp-91-107-201.html

68. Ministry of Interior. (2016). *Monthly Bulletin of InteriorStatistic*. Retrieved from http://sowf.moi.gov.tw/stat/month/elist.htm

69. Ministry of the Interior (2007). *Ten-year Long-Term Care Project (TLTCP)*. Taipei, Taiwan: Ministry of the Interior.

70. Mitra M, Bogen K, Long-Bellil LM, Heaphy D. (2011). Unmet needs for home and community-based services among persons with disabilities in Massachusetts. *Disability and Health Journal 4*(4): 219-228.

71. Muramatsu, N., Yin, H., & Hedeker, D. (2010). Functional declines, social support, and mental health in the elderly: Does living in a state supportive of home and community-based services make a difference? *Social Science & Medicine, 70*(7), 1050-1058.

72. National Development Council. (2016). *Population Projections for Republic of China (Taiwan): 2016-2060*. Retrieved from https://www.ndc.gov.tw/Content_List.aspx?n=84223C65B6F94D72.

73. National Development Council: Long-term care need/demand in Taiwan. Retrieved from: http://www.ndc.gov.tw/m1.aspx?sNo=0012090&ex=3#.VSxoivmUedI.

74. National Development Council: Taiwan population estimation year 2016 to 2060.

Retrieved from:

https://www.ndc.gov.tw/Content_List.aspx?n=84223C65B6F94D72.

75. Ng, T., Harrington, C., Musumeci, M., & Reaves, E. (2014). Medicaid home and community-based services programs: 2010 data update. Retrieved from http://kaiserfamily foundation.files.wordpress.com/2014/03/7720-07-medicaid-home-and-community-basedservices- programs_2010-data-update1.pdf

76. Noelker, L., & Browdie, R. (2013). Sidney Katz, MD: A new paradigm for chronic illness and long-term care. *The Gerontologist, 54*(1), 13-20.

77. National Institutes of Health Senior Health. *Long-Term Care: Home-Based Services.* (n.d.). Retrieved February 10, 2015, from http://nihseniorhealth.gov/longtermcare/homebasedservices/01.html

78. National Institutes of Health Senior Health. *Long-term care: Community-Based Services.* (n.d.). Retrieved from: http://nihseniorhealth.gov/longtermcare/communitybasedservices/01.html.

79. National Institutes of Health Senior Health. *Long-term care: Facility-Based Services*. (n.d.). Retrieved from: http://nihseniorhealth.gov/longtermcare/facilitybasedservices/01.html.

80. OECD (2015), "*Recipients of long-term care*", *in Health at a Glance 2015: OECD Indicators*, OECD Publishing, Paris. doi: http://dx.doi.org/10.1787/health_glance-

2015-75-en

81. Olivares-Tirado, P., Tamiya, N., Kashiwagi, M., & Kashiwagi, K. (2011). Predictors of the highest long-term care expenditures in Japan. *BMC Health Services Research, 11*(1). doi:10.1186/1472-6963-11-103

82. Oyama Y, Tamiya N, Kashiwagi M, Sato M, Ohwaki K, Yano E. (2013). Factors that allow elderly individuals to stay at home with their families using the Japanese long-term care insurance system. *Geriatr Gerontol Int.13*(3):764-73.

83. Pande, A., Laditka, S. B., Laditka, J. N., & Davis, D. R. (2007). Aging in place? Evidence that a state Medicaid waiver program helps frail older persons avoid institutionalization. *Home Health Care Services Quarterly*,*26*(3),39–60. doi:10.1300/J027v26n03_03

84. Rodriguez, M. (2013). Use of informal and formal care among community dwelling dependent elderly in Spain. *The European Journal of Public Health, 24*(4), 668-673.

85. Sands, L., Xu, H., Thomas, J., Paul, S., Craig, B., Rosenman, M., Weiner, M. (2012). Volume of home- and community-based services and time to nursing-home placement. *MMRR Medicare & Medicaid Research Review, 2*(3), mmrr.002.03.a03. doi: 10.5600/mmrr.002.03.a03

86. Sands, P. L., Wang, Y., McCabe, P. G., Jennings, K., Eng, C., & Covinsky, E. K. (2006). Rate of acute care admissions for frail older people living with met unmet

activity of daily living needs. *Journal of the American Geriatrics Society*, *4*(2), 339–344. doi:10.1111/j.1532-5415. 2005.00590.x

87. Segelman M, Intrator O, Li Y, Mukamel D, Veazie P, Temkin-Greener H.(2017). HCBS Spending and Nursing Home Admissions for 1915(c) Waiver Enrollees. *Journal of Aging & Social Policy*, doi: 10.1080/08959420.2017.13197

88. Sonnega A, Robinson K., & Levy H. (2016). Home and community-based service and other senior service use: Prevalence and characteristics in a national sample. *Home Health Care Serv Q. 36*(1):16-28. doi: 10.1080/01621424.2016.1268552.

89. Stuck, A., Egger, M., Hammer, A., Minder, C., & Beck, J. (2002). Home visits to prevent nursing home admission and functional decline in elderly people. *JAMA,* 287(8):1022-1028.

90. Taiwan Executive Yuan (2007). *Ten-year long-term project in Taiwan*. Taipei: Taiwan Executive Yuan, Taiwan.

91. Taiwan ExecutiveYuan R.O.C. (2011). *Ten-Year Plan for Long-Term Care in Taiwan–Middle-Term Plan101–104.* Retrieved from: http://search.mohw.gov.tw/TSSearch/SearchResult?DataSource= MOHW CHT&SearchTemplate=4&Keyword=%E9%95%B7%E6%9C% 9F%E7%85%A7%E8%AD%B

92. Taiwan Executive Yuan (2017). *Taiwan promotes 10-year long-term care 2.0 plan.*

Retrieved September 14, 2017, from http://english.ey.gov.tw/News_Hot_Topic.aspx?n=FE8C5966F81D8273&sms=BBB420E471DAF6C0

93. Tomita, N., Yoshimura, K., & Ikegami, N. (2010). Impact of home and community-based services on hospitalisation and institutionalisation among individuals eligible for long-term care insurance in Japan. *BMC Health Services Research , 10*, 345-345. doi: 10.1186/1472-6963-10-345

94. Tretteteig, S., Vatne, S., & Rokstad, A. (2016). The influence of day care centres for people with dementia on family caregivers: an integrative review of the literature. *Aging Ment Health.20*(5):450-462.

95. Tsai, A., & Lai, T. (2011). Predicting the need of formal care in Taiwan: Analysis of a national random sample. *Archives of Gerontology and Geriatrics, 53*(3), 298-302. doi: 10.1016/j.archger.2010.12.003

96. Vasunilashorn, S.; Steinman, B.A.; Liebig, P.S.; Pynoos, J. Aging in place: Evolution of a research topic whose time has come. *J. Aging Res. 2012,* 120952. doi:10.1155/2012/120952

97. Wang, H., & Tsay, S. (2012). Elderly and long-term care trends and policy in Taiwan: Challenges and opportunities for health care professionals. *Kaohsiung J Med Sci. 28*(9):465-469. doi: 10.1016/j.kjms.2012.04.002

98. Wee, S., Liu, C., Goh, S., Chong, W., Aravindhan, A., & Chan, A. (2014). Determinants of use of community-based long-term care services. *Journal of the American Geriatrics Society J Am Geriatr Soc,* 62(9), 1801-1803. doi: 10.1111/jgs.13003

99. World Health Organization (2000). *Home-Based Long-Term Care: Report of A WHO Study Group (Who Technical Report)*.

100. World Health Organization. *Community home based care. Action research in Kenya. September-October 2000.* Author, Geneva, Switzerland; 2001.

101. Wong, A., Groot, R., Polder, J., & Exel, J. (2010). Predictors of long-term care utilization by dutch hospital patients aged 65. *BMC Health Services Research, 10*, 110. doi: 10.1186/1472-6963-10-110

102. Won CW. T. (2013). Elderly long-term care in Korea. *Journal of Clinical Gerontology & Geriatrics 4(1)*, 4-6.

103. Wu, C., Hu, H., Huang, N., Fang, Y., Chou, Y., & Li, C. (2014). Determinants of long-term care services among the elderly: a population-based study in Taiwan. *PLoS ONE, 9*(2). doi:10.1371/journal.pone.0089213

104. Wu, Y. (2004). Review of Taiwan 's Home Service. *Community Development Journal.106*:132-140.

105. Wysocki A, Butler M, Kane RL, Kane RA, Shippee T, Sainfort F. (2015) Long-term

services and supports for older adults: a review of home and community-based services versus institutional care. *Joural of Aging Social Policy*. *27*(3):255–279.

106. Xu, H., Weiner, M., Paul, S., Thomas, J., Craig, B., Rosenman, M., Doebbeling CC; Sands, L. (2009). Volume of home- and community-based Medicaid waiver services and risk of hospital admissions. *Journal of the American Geriatrics Society, 58*(1), 109-115. doi:10.1111/j.1532-5415.2009.02614.x

Curriculum Vita

Mei-Ju, Chuang
No.790-155, Jhongsiao Rd.,
Chiayi City 600, Taiwan
886-5-2338066-311
meiju211@gmail.com

Education

Johns Hopkins Bloomberg School of Public Health Baltimore, MD
PhD Candidate, Department of Health Policy and Management September 2011 - September 2017
Advisor: Leiyu Shi, Dr.P.H., M.B.A., M.P.A
PhD Dissertation Title: *Home and Community-Based Long-Term Care Services in Taiwan: Factors and Effects Associated with The Utilization by Community Dwelling Dependent Elderly*

National Chung Cheng University Chiayi ,Taiwan
MS, Information Management 2001-2004

National Taiwan University Taipei Taiwan
MPH, Health Policy and Management 1993-1995

Taipei Medical University Taipei Taiwan
BS, Public Health 1989-1993

Work Experience

2013- Present Director of Long-Term Care Management Center, Chiayi City

2012- Present Chief of Secretary, Bureau of Health, Chiayi City

2006-2012 Chief of medical affairs Section, Bureau of Health, Chiayi City
Chief of health resources Section, Long-Term Care Management Center, Chiayi City
- In charge of all affairs in medical affairs Section
- In charge of health resource planning

2003-2006 Chief, Planning Section, Bureau of Health, Chia-Yi City
- In charge of all affairs in Planning Section

1999-2003 Member of Planning Section, Chiayi Hospital, Department of Health
- In charge of research and evaluation affairs
- In charge of planning and related affairs
- Research Plan on "Cognition and behavior of employees in public hospitals run by either government or civilian – Taking Chia-yi Hospital, DOH for example", subsidized by Research Development and Evaluation Commission in 2001

1999-2000 Part-time Lecturer in National Open University in Chia-yi City
- Lecturer of Health Care

1997-1999 Medical care quality control in Medicare Quality Review Committee, National Taiwan University Hospital, in Taipei City
- Working on clinical path in order to uplift medical care quality and reduce medical care charges
- Working on medical care quality indicators

- Co-write “Clinical path theory and practice” with NTUH superintendent and others

1995-1997 Member of Medical Charges Section,BNHI Taipei Branch, Taipei City

- In charge of general affairs and verification of medical care fees
- Elected Outstanding Employee in BNHI Taipei Branch

1994-1995 Member of Hospitalization Charges Section, Medicare Department,Bureau of Labor Insurance in Taipei City

- In charge of general affairs and verification of medical care fees

Publications

1. Self-reported long-term fixed medication research of elderly in Taipei community (A master degree thesis tutored by Professor Wu, Shu-Chiung)
2. Construction of Performance Indicator for National Immunization Information System (A master degree thesis tutored by Professor Hwang, Hsin-Ginn).
3. Clinical path theory and practice, co-authored by Chu, Shu-Shiun and 13 others, published by Han Lu Publishing Co. Ltd., August, 2000
4. An initial research on multi-media computer aided teaching applied in medical care nursing - taking a certain regional teaching hospital for example（posted on Medical Informatics Symposium in Taiwan, October 2-6, 2002, Taipei, Taiwan）
5. Wan-Ting Tseng; Tsang-Hsiang Cheng; **Mei-Ju Chuang**; Te-Chia Huang; Hao-Hsien Lee; Knowledge Extraction for The Decision of Performing Costly Medical Examinations：The Decision to Perform Computed Tomography for Acute Appendicitis, Joint Conference on Medical Informatics in Taiwan 2009
6. Wei-Min Huang, Chuan-Feng Sun, **Mei-Ju Chuang**, Jiann-Juh Chen, and Huei-Yu Li, "An Empirical Study on the Using Behavior for the Wearable Health Devices in Taiwan", The BAI 2016 International Conference on Business and Information, Sapporo, Japan, 2016/07
7. Integration Health and Long Term Care, co-authored by Ye-Fan Wang Galvin and 32 others, published by Wunan Publishing Co. Ltd., November, 2016

Awards

The 1997 Outstanding Employee in BNHI Taipei Branch

The 2012 Outstanding Employee in Chiai City Government